Volume III
Appendix B

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Texas GulfLink Federal PSD Permit Application

Texas GulfLink, LLC
Texas GulfLink Project

PSD Permit Application for Deepwater Port Facility

PREPARED BY:

CK Associates
Environmental Consultants

8591 United Plaza Blvd
Suite 300
Baton Rouge, LA 70809
(225) 755-1000

CK Project No. 17073

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1.0 INTRODUCTION

Texas GulfLink, LLC plans to develop the Texas GulfLink Deepwater Crude Export Terminal project ("Project"), a proposed deepwater crude oil export terminal, located near Freeport, Texas, in Brazoria County. The Project will provide critical infrastructure to the Houston market to clear over supplied crude oil volumes from West Texas and the Midcontinent. As United States crude oil exports continue to increase, critical infrastructure along the Gulf Coast will be necessary to provide an efficient and safe solution for large-scale exporting to international markets. The completed facility will be capable of fully loading Very Large Crude Carrier (VLCC) vessels for the purpose of exporting crude oil to international markets.

1.1 Project Description

The Texas GulfLink Terminal Project will construct a Deepwater Oil Port near Freeport, Texas, capable of loading deep draft VLCC vessels. The Deepwater Port will deliver crude oil via an onshore crude pipeline to above-ground crude oil storage tanks. Upon nomination from the crude oil shipper, the oil will be transported to one of two floating Single Point Mooring (SPM) buoys in the Gulf of Mexico, approximately 28.3 nautical miles offshore, via a 42-inch pipeline. The SPM buoys will allow for VLCC vessels to moor and receive up to 2 million barrels of crude oil each to be transported internationally. A manned offshore platform, equipped with round-the-clock port monitoring, custody transfer metering, and surge relief will provide assurance that shippers' commercial risks are mitigated and that the port is protected from security threats and environmental risks.

The Deepwater Port *offshore* facility will consist of the following assets:

- One 42-inch outside diameter, 28.3 nautical mile long crude oil pipeline will be constructed from the shoreline crossing in Brazoria County, Texas, to the Texas GulfLink Deepwater Port, for crude oil delivery. The pipeline, in conjunction with 12.3 statute miles of new-build 42-in onshore pipeline, will connect the onshore crude oil storage facility and pumping station (Jones Creek Crude Storage Terminal) to the offshore Texas GulfLink Deepwater Port. The crude oil will be metered departing the onshore terminal as it leaves the tank and again at the offshore platform, providing custody transfer and line surveillance.
- Two fixed offshore platforms with 4 piles each, located within the Galveston Outer Continental Shelf lease block 423, approximately 28.3 nautical miles off the coast of Brazoria County, Texas, in a water depth of approximately 105 feet. The fixed platform will be constructed with three decks, including generators, pig receivers, lease automatic custody transfer (LACT) unit, oil displacement prover loop, living quarters, electrical and instrumentation building, portal cranes, helideck, and a vessel traffic control room utilizing a state-of-the-art radar system.

- The Deepwater Port will utilize two (2) Single Point Moring (SPM) buoys, each having:
    - Two (2) 24-inch inside diameter crude oil subsea hoses interconnecting with the crude oil pipeline end manifold (PLEM)
    - Two (2) 24-inch inside diameter floating crude oil hoses connecting the moored VLCC or other crude oil carrier for loading to the SPM buoy – The floating hoses will be approximately 800 feet in length and rated for 275 psig (18.9 bar). Each floating hose will contain an additional 200 feet of 16-inch "rail tail hose" designed to be lifted and robust enough for hanging over the edge railing of the VLCC or other crude oil carrier. The subsea hoses will be approximately 160 feet in length and rated for 275 psig (18.9 bar).
- Two (2) PLEMs will provide the interconnection between the pipelines and the SPM buoys. Each SPM buoy will have one (1) PLEM for crude oil export. Each crude oil loading PLEM will be supplied with crude oil by one (1) 42-inch outside diameter pipeline, each approximately 1.25 nautical miles in length.

The Deepwater Port *onshore* project components will consist of the following:

- New installed 9.45 miles of 36" pipeline from the Department of Energy (DOE) facility at Bryan Mound to the Texas GulfLink Jones Creek Crude Storage Terminal.
- The proposed Jones Creek Crude Storage Terminal located in Brazoria County, Texas, on approximately 200 acres of land consisting of thirteen (13) above-ground external floating roof (EFR) storage tanks, with a site-wide maximum storage capacity of approximately 9.2 million barrels of "sweet" crude oil.
- The Jones Creek Terminal will also include:
    - Six (6) electric-driven mainline crude oil pumps
    - Three (3) electric driven booster crude oil pumps
    - One (1) crude oil pipeline pig launcher
    - One (1) crude oil pipeline pig receiver
    - Two (2) measurement skids for measuring crude oil – one (1) skid located at the incoming pipeline from the Bryan Mound facility and one (1) skid installed for the outgoing crude oil barrels leaving the tank storage to be loaded on the VLCC
    - Ancillary facilities, to include an operations control center, electrical substation, offices, and warehouse building.

1.2 Purpose

Pursuant to Title 40 of the Code of Federal Regulations, Part 52, Section 52.21 (40 CFR 52.21), Texas GulfLink, LLC respectfully submits this Prevention of Significant Deterioration (PSD) permit application to authorize air pollutant emissions from the proposed offshore Deepwater Port, which is part of the Texas GulfLink Project. Pollutant emissions generated will include carbon monoxide (CO), nitrogen oxides (NOx), particulate matter with mean aerodynamic diameters less than or equal to 10 microns/2.5 microns (PM_{10}/$PM_{2.5}$), sulfur dioxide (SO_2), greenhouse gases

(GHG), expressed as carbon dioxide equivalent (CO_2e), and volatile organic compounds (VOC) with speciated Hazardous Air Pollutants (HAPs), such as benzene. Total facility-wide emission rates are summarized in Tables 3-1 and 3-2 of Section 3.0 of this application.

This permit application contains information sufficient to demonstrate compliance with applicable requirements outlined in 40 CFR 52.21. This information includes a description of the Deepwater Port facility, including the two SPMs, emission rate calculation (methods and calculation spreadsheets), a federal (top-down) Best Available Control Technology (BACT) an off-property impacts analysis, and federal air regulations applicability review.

1.3 Area Map

Figure 1 in Appendix A is an area map showing the proposed Texas GulfLink Deepwater Port facility to be located approximately 28.3 nautical miles offshore the coast of Brazoria County, Texas. As shown in the map, the proposed facility will consist of the fixed platform and two Single Point Mooring (SPM) buoys for loading the VLCCs.

2.0 PROCESS DESCRIPTION

As described in detail in Section 1.1 of this application, the proposed Texas GulfLink Deepwater Port facility will consist of a permanently manned offshore platform with two associated single point mooring (SPM) buoys for the loading of Very Large Crude Carriers (VLCCs). Sweet crude oil will be pumped via pipeline from the onshore Sentinel Midstream Texas GulfLink Jones Creek Crude Storage Terminal to the Deepwater Port facility to be loaded into the VLCC vessels. Air pollutant emissions from Deepwater Port facility operation will result from the following emission sources (Emission Point Number, EPN, given):

- VOC emissions from marine loading of crude oil into VLCC vessels [EPN (P) M-1]
- Combustion pollutant emissions from two diesel-fired emergency electric generator engines [EPNs (P) G-1 and (P) G-2]
- Combustion pollutant emissions from two diesel-fired portal cranes [EPNs (P) C-1 and (P) C-2]
- VOC emissions from two fixed roof tanks storing diesel fuel [EPNs (P) DT-1 and (P) DT-2]
- VOC emissions from one fixed roof crude oil surge tank [EPN (P) T-1]
- Combustion pollutant emissions from two diesel-fired emergency firewater pump engines [EPNs (P) FWP-1 and (P) FWP-2]
- VOC emissions from pipeline pigging operations [EPN (P) P-1]
- Fugitive VOC emissions from the platform piping components [EPN (P) F-1]
- Fugitive VOC emissions from piping components on the two SPM loading buoys [EPN (P) F-2]
- VOC emissions from crude oil sampling activities [EPN (P) S-1]
- VOC emissions from pump maintenance [EPN (P) PM-1]

A summary of each EPN, its description, and expected pollutants is presented in Table 2-1.

Table 2-1: Summary of Emission Sources at Deepwater Port Facility

EPN *	Description	Pollutant
(P) M-1	Marine loading into VLCCs	VOC **
(P) G-1	Diesel-fired emergency electric generator engine	Combustion ***
(P) G-2	Diesel-fired emergency electric generator engine	Combustion
(P) C-1	Diesel-fired portal crane engine	Combustion
(P) C-2	Diesel-fired portal crane engine	Combustion
(P) DT-1	Day tank storing diesel fuel (fixed roof)	VOC
(P) DT-2	Day tank storing diesel fuel (fixed roof)	VOC
(P) T-1	Crude oil surge tank (fixed roof)	VOC
(P) FWP-1	Diesel-fired emergency firewater pump engine	Combustion
(P) FWP-2	Diesel-fired emergency firewater pump engine	Combustion
(P) P-1	Pipeline pigging operations	VOC

EPN *	Description	Pollutant
(P) F-1	Fugitives from platform piping component leaks	VOC
(P) F-2	Fugitives from SPM piping component leaks	VOC
(P) S-1	Crude oil sampling activities	VOC
(P) PM-1	Routine pump maintenance	VOC

* (P) stands for Platform

** VOC emissions include speciated hazardous air pollutants (HAPs), such as benzene

*** Combustion pollutants are NOx, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, GHG (CO_2e), and un-combusted VOC

A simplified process flow diagram illustrating the offshore Deepwater Port's process is provided as Figure 2 and included in Appendix A of this application.

3.0 EMISSION RATE CALCULATION METHODS

In this section, the emissions rate calculation methods used to estimate maximum pollutant emissions from the proposed Deepwater Port Facility operations are described. Operation of the offshore facility will result primarily in emissions of volatile organic compounds (VOC). Lesser amounts will be emitted of nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), hydrogen sulfide (H_2S), particulate matter (PM), including PM with an aerodynamic diameter of 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$), and hazardous air pollutants (HAPs), including benzene. Greenhouse gas (GHG) emissions, expressed as carbon dioxide equivalent (CO_2e), were also addressed. Annual average (tons/yr) emission rates were estimated for each source of emissions. The emissions are on a Potential-to-Emit (PTE) basis. A summary of the site-wide total annual PTE rates for criteria and GHG pollutants is given in Section 3.1 below. A summary of site-wide total annual H_2S and HAP emission rates is given in Table 3-2 below. Detailed emission rate calculations are provided in Appendix B of this application.

Note that only those offshore pollutant emissions associated with the Deepwater Port Facility that can be permitted are addressed in this PSD permit application. Other offshore emissions associated with the Texas GulfLink Project, including those from construction and "indirect" sources (e.g. tug/pilot boats, other vessels, etc.), are not included in this permit application, but are addressed in the Emission Impacts Analysis section of the deepwater port license application.

3.1 Emissions Summary

Table 3-1 summarizes the site-wide total annual PTE emission rates of the criteria and greenhouse gas (CO_2e) pollutants for the proposed Deepwater Port Facility.

Table 3-1: Summary of Criteria and GHG PTE Rates for Deepwater Port Facility

EPN	Source	CO_2e	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO	Total VOC
		(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)
(P) M-1	Marine Loading							10,016.56
(P) G-1	Generator 1	2413	0.76	0.76	4.76	14.12	13.36	1.15
(P) G-2	Generator 2	2413	0.76	0.76	4.76	14.12	13.36	1.15
(P) C-1	Crane 1	1998	0.85	0.85	5.29	15.68	14.84	1.27
(P) C-2	Crane 2	1998	0.85	0.85	5.29	15.68	14.84	1.27
(P) DT-1	Day Tank 1							0.01
(P) DT-2	Day Tank 2							0.01
(P) T-1	Surge Tank							2.91
(P) FWP-1	Firewater Pump	20	0.01	0.01	0.04	0.11	0.10	0.01
(P) FWP-2	Firewater Pump	20	0.01	0.01	0.04	0.11	0.10	0.01
(P) P-1	Pigging Operations							0.26
(P) F-1	Platform Fugitive Emissions							0.05
(P) F-2	SPM System Fugitives							0.44
(P) S-1	Sampling Activities							0.05
(P) PM-1	Pump Maintenance							0.002
	TOTAL EMISSIONS (TPY)	**8,862**	**3.23**	**3.23**	**20.16**	**59.82**	**56.59**	**10,025.14**

As shown in Table 3-1, the total site-wide VOC emission rate is greater than the PSD major source emissions threshold of 250 ton/yr. As described in more detail in Section 4.0 of this application, because emissions of VOC trigger PSD for the facility, the other pollutants' emission increases are compared to their respective PSD *significance* emission thresholds. The PSD significance threshold for NOx is 40 tpy; therefore, as shown in the table, PSD is triggered for NOx as well. The other pollutants have increases below their respective PSD significance emission thresholds; thus, the facility is considered minor with respect to PSD for these pollutants.

Table 3-2 summarizes the site-wide total annual PTE emission rates of H_2S and HAP pollutants for the proposed Deepwater Port Facility.

Table 3-2: Summary of H_2S and HAP PTE Rates for Deepwater Port Facility

EPN	Source	H_2S	Benzene	Isopropyl benzene	Ethylbenzene	Formaldehyde	Hexane (-n)	2,2,4-Trimethylpentane (isooctane)	Toluene	Xylene (-m)
		(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)
(P) M-1	Marine Loading	0.08	110.47	0.846	7.41		118.37	9.51	54.07	21.68
(P) G-1	Generator 1					0.02				
(P) G-2	Generator 2					0.02				
(P) C-1	Crane 1					0.02				
(P) C-2	Crane 2					0.02				
(P) DT-1	Day Tank 1									
(P) DT-2	Day Tank 2									
(P) T-1	Surge Tank		0.02	0.000	0.00		0.02	0.000	0.01	0.00
(P) FWP-1	Firewater Pump									
(P) FWP-2	Firewater Pump									
(P) P-1	Pigging Operations		0.003				0.003		0.001	0.001
(P) F-1	Platform Fugitive Emissions								0.000	0.001
(P) F-2	SPM System Fugitives									
(P) S-1	Sampling Activities									
(P) PM-1	Pump Maintenance									
	TOTAL EMISSIONS (TPY)	**0.08**	**110.49**	**0.85**	**7.41**	**0.07**	**118.39**	**9.51**	**54.08**	**21.68**

The major source definition that would make a facility major for HAPs is 10 tons/yr of a single HAP or 25 tons/yr of an aggregate of all HAPs. As shown in Table 3-2, there are individual HAPs that will have emission rates greater than 10 tons/yr (i.e., benzene, hexane, toluene, and xylene). Additionally, the aggregate total emissions from all HAPs is greater than 25 tons/yr. Therefore, the Deepwater Port Facility is considered major with respect to HAPs. As described in Section 6.0 of this application, the applicability of federal air quality rules was determined based upon the Deepwater Port Facility being considered major for HAPs.

The following sections describe the calculation methods used to estimate pollutant emissions from the various emission units at the Deepwater Port Facility.

3.2 Marine Loading [EPN (P) M-1]

Crude oil will be loaded into VLCCs at the Deepwater Port at a proposed annual rate of 365 million barrels per year (bbl/yr). The maximum hourly rate for crude loading will be 85,000 bbl/hr. VOC emissions from loading were estimated using EPA emission factors from AP-42, Chapter 5, Section 5.2. Equation 2 in this section was developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges.

Based upon expected crude oil slates, a Reid Vapor Pressure (RVP) of 8 psi was assumed for the marine loading emission rate calculations. The maximum H_2S concentration in the sweet crude was assumed to be 5 parts per million by volume (ppm_v). The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program.

3.3 Diesel-Fired Electric Generator Engines [EPNs (P) G-1 and (P) G-2]

Two 350 KW generators will be used to supply electricity to the platform. Maximum emission rates for the combustion pollutants of NOx, CO, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 89.112(a) Table 1, as referenced by 40 CFR 60, NSPS IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.3 for “uncontrolled gasoline and diesel industrial engines”. This factor was used because the generator engines are each rated at less than 600 brake horsepower (bhp). Finally, the emission factors for GHG were obtained from 40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel).

3.4 Diesel-Fired Portal Crane Engines [EPNs (P) C-1 and (P) C-2]

Two 439 KW cranes will be used on the platform. Maximum emission rates for the combustion pollutants of NOx, CO, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 89.112(a) Table 1, as referenced by 40 CFR 60, NSPS IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.3 for “uncontrolled gasoline and diesel industrial engines”. This factor was used because the generator engines are each rated at less than 600 brake horsepower (bhp). Finally, the emission factors for GHG were obtained from 40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel).

3.5 Tanks Storing Diesel Fuel [EPNs (P) DT-1 and (P) DT-2]

The Deepwater Port will include two fixed-roof tanks used to store diesel fuel, each with a storage capacity of 20,000 gallons. VOC emissions were calculated using U.S. EPA’s TANKS 4.09d program. The throughput is proposed to be 300,000 gallons per year. The HAP speciation profile was obtained from the default speciation for diesel in the TANKS 4.09d program.

3.6 Crude Oil Surge Tank [EPN (P) T-1]

The Deepwater Port will include one fixed roof tank used as a surge tank, with a storage capacity of 420,000 gallons. VOC emissions were calculated using U.S. EPA's TANKS 4.09d program. Based upon expected crude slates, a Reid Vapor Pressure (RVP) of 8 psi was assumed for the surge tank emission calculation. The throughput is proposed to be 84,000 gallons per year. The maximum H_2S concentration in the sweet crude was assumed to be 5 ppm_v. The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program.

3.7 Firewater Pump Engines [EPNs (P) FWP-1 and (P) FWP-2]

The two emergency-use firewater pumps will be started periodically to ensure their proper operation. Maximum emission rates for the combustion pollutants of NOx, CO, SO_2, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from AP-42, Table 3.3-1 for "uncontrolled gasoline and diesel industrial engines". These factors were used because the emergency fire water pump engines are each rated at less than 600 brake horsepower (bhp). Neither engine will be operated as part of reliability testing for more than 100 hours per year. Finally, the emission factors for GHG were obtained from 40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel).

3.8 Pipeline Pigging Operations [EPN (P) P-1]

VOC emissions will result from pipeline pigging operations at the Deepwater Port. Emissions were estimated for pig launching and receiving using the worst-case operation as the emissions basis for the application. The volume (actual cubic feet) of each pig launcher and receiver was calculated based on the inside diameter and length. Because the receiver is at pressure (≤ 1 psig) before it is opened, the volume of gas inside (assumed to be entirely emitted to atmosphere) is corrected to standard volume (standard cubic feet).

VOC emissions were calculated by, first, dividing the standard volume (scf) of the chamber vapor to the molal volume of an ideal gas (385.3 scf/lb-mol) to obtain the lb-mol of emitted vapor when the chamber is opened to the atmosphere. Then, to obtain the mass rate, the vapor molecular weight of crude oil (50 lb/lb-mol) was multiplied to the lb-mol of emitted vapor. This calculation results in a mass rate per receiving event (lb/event). To obtain a maximum hourly rate (lb/hr) and annual average rate (tpy), it was assumed that a single pigging event lasts for a half hour, and that the maximum number of pigging events per year will be twelve events.

3.9 Platform Fugitive Emissions [EPN (P) F-1]

Fugitive VOC emissions will result from assumed small emission leaks from piping components such as valves, connectors (flanges), and pump seals. Emissions factors from TCEQ's guidance document, *Air Permit Technical Guidance for Chemical Sources – Fugitive Guidance* (APDG 6422, June 2018), were used to estimate VOC emissions. Specifically, the "Petroleum Marketing Terminal" factors from Table II of the document were used, which factors assume a 28 PET leak detection and repair (LDAR) program will be implemented. The 28PET leak detection and repair

(LDAR) program is specific to petroleum marketing terminals and involves an audio, visual, and olfactory (AVO) inspection of the above-ground pipeline system. An emissions control credit is included in the emission factors, so no other control credits were applied.

For the calculations, based on vapor pressure, crude oil is assumed to be a “Light Liquid”. The total VOC emission rate was obtained by multiplying the count of a particular component (e.g. valve) by the component’s emission factor in Light Liquid service, then summing the emissions from all components. The maximum H_2S concentration in the sweet crude was assumed to be five ppm_v. The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program.

3.10 SPM System Fugitive Emissions [EPN (P) F-2]

Valves and flanges associated with the Single Point Mooring (SPM) buoys are assumed to emit VOC. To estimate these emissions, emission factors were obtained from *Table 4, Average Emission Factors – Petroleum Industry (Oil & Gas Production Operations) of TCEQ's Addendum to RG-360A, Emission Factors for Equipment Leak Fugitives Components*, January 2008. Light liquid emission factors were used, and emissions were conservatively estimated to be 100% VOC.

3.11 Crude Sampling Activities [EPN (P) S-1]

Crude oil assay quality testing will occur at the platform. The crude will be sampled, and its physical and chemical properties will be determined for quality assurance. Very small VOC emissions will occur as a result of this sampling activity. To estimate VOC emissions, it was assumed that one sample would be taken each work shift, with three shifts per day. A VOC emission of 0.1 lb/sample was assumed.

3.12 Routine Pump Maintenance [EPN (P) PM-1]

The four electric-driven crude pumps at the Deepwater Port will need periodic maintenance. Very small amounts of VOC emissions will result from opening and draining the pumps. The emissions were estimated assuming 1 lb of VOC will be emitted per maintenance event, and that there will be one maintenance event for each of the four pumps per year.

4.0 PSD APPLICABILITY ANALYSIS

This section describes the applicability of the Prevention of Significant Deterioration (PSD) permitting program under 40 CFR 52.21 to the proposed Texas GulfLink offshore Deepwater Port Facility. The offshore facility will be located in federal waters on the Outer Continental Shelf (OCS), at a distance greater than 9 nautical miles, but less than 200 nautical miles, from the Texas coast. Because the facility will not be located in a designated nonattainment area, the Nonattainment New Source Review (NNSR) permitting program does not apply. Additionally, because the offshore facility will be located outside of Texas' seaward boundary (i.e., greater than 9 nautical miles off the coast), the US EPA is the governing permit authority.

As described in Section 2.0 of this application, the offshore facility will consist of a fixed platform and two Single Port Mooring (SPM) buoys that will be used to load crude oil onto Very Large Crude Carriers (VLCCs). As shown in Table 3-1 of this application, VOC will be emitted at the Deepwater Port Facility greater than the major source emissions threshold of 250 tpy, as defined in §52.21(b)(1)(i)(*a*). Therefore, the PSD permitting program is triggered for VOC. Under the PSD rules, if one PSD-regulated pollutant makes the stationary source major for PSD, then one must review the other regulated pollutants' emission increases against their respective PSD *significance* thresholds, given in §52.21(b)(23(i). The PSD significance threshold for NOx is 40 tpy. As shown in Table 3-1 above, the total estimated facility-wide emission rate of NOx is 59.8 tpy. Therefore, PSD is triggered for NOx as well. The remaining PSD-regulated pollutants (i.e., CO, SO_2, $PM/PM_{10}/PM_{2.5}$, and H_2S) have total emissions less than their respective PSD significance thresholds; therefore, the Deepwater Port Facility is considered minor with respect to PSD for these pollutants. Note that, although GHG (CO_2e) is a PSD-regulated pollutant, it does not have a defined significant threshold.

For those regulated pollutants that trigger PSD review, the following analyses are required:

1. Best Available Control Technology (BACT) analysis for each pollutant emitted in significant amounts, per §52.21(j)(2);
2. Off-property impacts analysis, demonstrating compliance with the National Ambient Air Quality Standard (NAAQS) and maximum allowable increase over the baseline concentration in the area ("increment") per §52.21(k). An appropriate air quality model must be used per §52.21(l). Pre-application PSD significance modeling would be performed, first, per §52.21(m);
3. Additional impact analyses, per §52.21(o); and
4. Federal Class I Area impact analysis, per §52.21(p).

These PSD analyses were performed for VOC and NOx as described in the following sections of this application. Note that there is no *de minimis* air quality level (i.e., SIL) provided for ozone, although demonstration of the ozone NAAQS is required. Therefore, per §52.21(i)(5)(i) [see Note to Paragraph (c)(50)(i)(f)], for any net emissions increase of 100 tons per year or more of VOC or NOx subject to PSD, the applicant is required to perform an ambient impact analysis, including the gathering of ambient air quality data. The ozone impacts analysis is provided in Section 7.0 of this application.

5.0 FEDERAL (TOP-DOWN) BACT ANALYSIS

For projects subject to PSD permitting, the federal Clean Air Act (42 U.S.C. § 7475(a)(4)) and federal Prevention of Significant Deterioration (PSD) regulations (40 CFR 52.21) require that Best Available Control Technology (BACT) be installed on new emissions units and existing affected emissions units that are modified by a Project, with regard to the pollutants for which PSD is triggered. As described in Section 4.0 of this application, the proposed Deepwater Port Facility is subject to PSD permitting for VOC and NOx emissions. This section presents the required control technology review for the proposed project's emissions units that are subject to PSD permitting. A general discussion of the BACT analysis procedure is presented followed by top-down BACT analyses for the affected emission units.

5.1 General BACT Overview

BACT Applicability

Applicability of BACT is required by 40 CFR 52.21(j)(2) as follows:

> *"A new major stationary source shall apply best available control technology for each regulated NSR pollutant that it would have the potential to emit in significant amounts."*

The regulated NSR pollutants for which the Project will result in a significant net emissions increase are VOC and NOx, for which a BACT analysis is required. The constructed emission units addressed in this BACT are:

1) Marine Loading of Crude
2) Diesel Storage Tanks
3) Crude Surge Tank
4) Diesel Engines

Fugitive equipment leaks will not be formally addressed by this BACT analysis as total fugitive emissions are estimated to be 0.49 tpy VOC (see Table 3-1) and any stringent controls will be cost prohibitive, easily exceeding $20,410 per ton of VOC controlled if assuming a conservatively low annualized capital cost of only $10,000. Compliance with applicable regulations combined with good engineering design and work practices will be the only feasible control options for fugitive emissions, both of which will be implemented.

BACT Methodology

According to 40 CFR 52.21(b)(12), BACT "*means an emissions limitation* [...] *based on the maximum degree of* [achievable emissions control] *taking into account energy, environmental, and economic impacts and other costs*." BACT can be add-on control equipment or can be a specified equipment design or process methods, such as work practices or combustion techniques. Over time, the U.S. EPA has interpreted the determination of BACT to require an analysis that addresses two core criteria:

1. A BACT analysis must include consideration of the most stringent available technologies (i.e., those that provide the "maximum degree of emissions reduction"); and

2. Any decision to require as BACT a control alternative that is less effective than the most stringent available must be justified by an analysis of objective indicators showing that energy, environmental, and/or economic impacts render the most stringent alternative unreasonable or otherwise not achievable.

U.S. EPA developed what is known as the "top-down" approach for conducting BACT analyses and has indicated that this approach should produce a BACT determination satisfying the above two core criteria. Under the "top-down" approach, progressively less stringent control technologies are analyzed until a level of control considered BACT is determined, based on the most effective control option that is determined to result in acceptable environmental, energy, and economic impacts.

The top-down BACT analysis methodology consists of five steps:

1. Identify all "available" control options that might be utilized to reduce emissions of the subject pollutant for the type of source/unit subject to BACT.

2. Eliminate those available options that are technically infeasible to apply to specific emissions unit(s) under consideration.

3. Rank the remaining technically feasible control options by control effectiveness.

4. Evaluate economic, energy and/or environmental impacts of each remaining control option as applied to the subject emissions unit, rejecting those options for which the adverse impacts outweigh the beneficial impacts.

5. Based on the most effective control option not rejected in Step 4, select an emission limit or work practice as BACT, reflecting the level of control continuously achievable with the selected control option.

40 CFR 52.21(b)(12) also states that "*in no event shall application of* [BACT] *result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60* [NSPS] *and 61* [NESHAP]", and presumably also any other federal program such as part 63]. In cases in which the regulatory requirement specified by one of these NSPS, NESHAP, or other required air programs is the top control, the full top-down evaluation is deemed to be unnecessary.

Technical Feasibility Analysis

As described in the U.S. EPA's *draft* New Source Review (NSR) Workshop Manual ("1990 Manual"), determining whether a control technology is technically feasible is straightforward for those that have already been demonstrated. Control technologies that have been installed and operated successfully on the type of source under BACT would be technically feasible. For determining whether undemonstrated control technologies are technically feasible, the 1990 Manual identifies the two key concepts to consider are "availability" and "applicability". A technology is considered "available" if it can be obtained commercially or is otherwise available within the common sense meaning of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under consideration. A technology that is both available and applicable is technically feasible.

The technical feasibility of each available control option should be assessed by an applicant with the final decision being delegated to the reviewing authority. In the absence of a review of technical feasibility by the applicant for a given control technology, it will be presumed that the technology is technically feasible. When an available, but emerging, control technology has not yet been demonstrated to be technically feasible, the applicant cannot be compelled by the reviewing authority to delay project implementation for the purpose of allowing further research and development to potentially demonstrate technical feasibility.

Economic Analysis

The economic impacts are most commonly represented by a cost effectiveness parameter, which is expressed as an annualized dollar cost per ton of pollutant abated. The 1990 Manual states that the "*average cost effectiveness (total annualized costs of control divided by annual emission reductions* […] *is a way to present the costs of control".* In other words, the cost effectiveness value can be viewed as the annualized cost to reduce a single ton of pollutant.

In this analysis, any required economic evaluations are based on budget estimates. If the top feasible control alternative is selected as BACT, then an economic evaluation is not necessary. However, if the selected BACT control option is not the top <u>technically</u> feasible control alternative, then in accordance with EPA's BACT guidelines, a cost effectiveness calculation and/or a review of energy and environmental impacts for the top technically feasible option will be presented, as required, to demonstrate that the top option is either economically infeasible and/or that it should be rejected due to adverse energy or environmental impacts.

Identification of Emission Control Technologies

A review of the U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC) database was performed to identify emission control strategies relevant to emission units of the proposed Project. The RBLC database query can be found in Appendix C to this application. Other references and sources were consulted to identify top emission controls, such as pollution control experts, vendors, published technical information, and BACT determinations approved by state and federal environmental agencies that may not yet have been incorporated into the RBLC database.

BACT Baseline

Emission units to be constructed or modified as part of the Project will be subject to applicable NSPS rules under 40 CFR Part 60 and/or applicable NESHAP rules under 40 CFR Part 63. For these units, and for the pollutants to which these standards apply, the applicable NSPS and NESHAP emission limitations establish the minimum allowable (least stringent) emission limitations or a "baseline" or "floor" for the BACT analysis. The performance, feasibility, and costs of more stringent control options evaluated for possible application to the emissions units must be compared to these baselines.

Consideration of Inherently Lower Polluting Processes/Practices

EPA does not consider that the chosen BACT technology should be a means to "redefine the design of the source" as described in the 1990 Manual, and especially not to redefine the overall purpose of the proposed facility. However, consideration of alternative production processes is an expected part of a BACT analysis in some cases where such technologies may be available. An example would be consideration of natural gas-fired electric turbines where an applicant is proposing higher-polluting coal-fired electric generators. Combining inherently lower-polluting processes/practices and add-on controls usually will provide a higher level of emissions control than employing either technology alone. Therefore, the availability of an alternative process/practice does not exclude the need to also include available add-on control technologies in a BACT analysis.

5.2 Summary of Proposed BACT

Table 5-1 presents a summary of proposed BACT for the emission sources of the proposed Project. Details of the BACT analyses are presented in the following sections.

Table 5-1: Summary of Proposed Federal BACT

Emissions Unit Category	Pollutant	BACT Selection
Ship Loading	VOC	• Submerged Loading, and • Implementation of ship-specific VOC Management Plans in compliance with the requirements of MEPC.185(59).
Platform and SPM Buoy Fugitives	VOC	• Compliance with applicable regulations, and • Good engineering design and work practices.
Diesel Tanks	VOC	• Fixed roof tanks, • Tanks painted white, • Equipped with submerged fill pipes, and • Maintain compliance with applicable regulatory work practices.
Crude Surge Tank	VOC	• Fixed roof tank, • Tank painted white, • Equipped with submerged fill pipe, and • Maintain compliance with applicable regulatory work practices.

Emissions Unit Category	Pollutant	BACT Selection
Diesel Engines (Generators, Firewater Pumps, Cranes)	VOC	• Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ, and • Good combustion practices.
	NOx	• Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ, and • Good combustion practices.

5.3 Ship Loading – VOC BACT

Loading losses from marine vessels (ships) are the primary source of evaporative emissions from the proposed Project. Loading losses occur when organic vapors in "empty" vessels are vented to the atmosphere by the liquid being loaded into the vessel.

Step 1: Identify Available Control Options

A search of the RBLC database for “offshore” loading of ships across all available types of industries yielded no results of BACT determinations, dating back to January 2009. The following control options are the identified available Ship Loading VOC control options for Step 1 of the top-down review based on an RBLC database search of facilities known to be at onshore locations:

- Vapor Combustion Unit (VCU)
- Vapor Recovery Unit (VRU)
- Submerged Loading
- VOC Management Plan (implemented by the ship)

<u>Vapor Combustion Unit (VCU)</u>
With this technology, emissions from the ship loading operation would be captured and routed to a combustion device for destruction, such as vapor combustors or a flare. A VCU has its own negative environmental effects of producing other combustion products including NOx, CO, SO_2, PM, and CO_2. A VCU would also require combustion of additional hydrocarbons as pilot gas and enrichment gas, thereby creating even more emissions.

<u>Vapor Recovery Unit (VRU)</u>
In a VRU, emissions are captured as vapors and condensed back to liquid phase by refrigeration, absorption, adsorption, and/or compression, then returned to the emitting vessel. Additional emission sources such as engines would be required to provide the necessary mechanical power for the vapor condensing equipment and to pump recovered liquids.

<u>Submerged Loading</u>
Submerged loading is a loading method in which the fill pipe is extended close to the bottom of the ship’s cargo tank prior to beginning the loading process. During most of the loading process, the fill pipe opening is below the liquid surface level (i.e., submerged). The alternative loading

method is known as “splash loading” in which the fill pipe is only partially lowered into the cargo tank and significant turbulence and vapor/liquid contact occurs during the loading process, thereby generating significantly more emissions than submerged loading. Submerged loading greatly reduces VOC emissions by avoiding disturbance of the liquid surface and the creation of aerosol droplets due to splashing.

<u>VOC Management Plan</u>

A VOC Management Plan is required for all ships transporting crude oil as mandated by regulation 15.6 of the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI. The VOC Management Plan must at a minimum cover the specific points in the regulation and the plan must be approved by the governing authority. Guidelines for the development of VOC Management Plans is given in Marine Environmental Protection Committee Resolution 185(59) (MEPC.185(59)) and additional information on systems and operations of VOC Management Plans is given in MEPC.1/Circ.680.

The regulation requires that VOC-generating vessels be specifically evaluated, and procedures written, to ensure that ship operations follow best management practices for preventing or minimizing VOC emissions to the extent possible. Rule 1.4. of the VOC Management Plan Guideline (MEPC.185(59)) states that while maintaining the safety of the ship, the VOC Management Plan should encourage and, as appropriate, set forth the following best management practices:

1. Loading procedures should take into account potential gas releases due to low pressure and, where possible, the routing of oil from crude oil manifolds into the tanks should be done so as to avoid or minimize excessive throttling and high flow velocity in pipes;

2. The ship should define a target operating pressure for the cargo tanks. This pressure should be as high as safely possible, and the ship should aim to maintain tanks at this level during the loading and carriage of relevant cargo;

3. When venting to reduce tank pressure is required, the decrease in pressure in the tanks should be as small as possible to maintain the tank pressure as high as possible;

4. The amount of inert gas added should be minimized. Increasing tank pressure by adding inert gas does not prevent VOC release, but it may increase venting and, therefore, increased VOC emissions; and

5. When crude oil washing is considered, its effect on VOC emissions should be taken into account. VOC emissions can be reduced by shortening the duration of the washing or by using a closed cycle crude oil washing program.

In addition, the VOC Management Plan should further consider and address a Responsible Person for implementing the plan, procedures for minimizing emissions from specified types of operations, use of VOC reduction devices with which the ship is equipped, and training programs.

Step 2: Eliminate Technically Infeasible Control Options

Vapor Combustion Unit (VCU)

VCU control technology has been demonstrated as technically feasible in land-based applications, but not in offshore locations like the proposed Single Point Mooring (SPM) buoy system. The offshore location, weather conditions, and sea conditions present many challenges that render VCU control technology infeasible due to safety and energy concerns, and this technology is considered undemonstrated for offshore applications:

- An enrichment system would be required by a VCU to ensure that the recovered vapors have sufficient heat of combustion to be efficiently destroyed by the VCU. Since no fuel gas pipeline providing suitable enrichment gas would be readily present in the remote offshore location, a VCU system would require significant storage of propane on the platform. Propane transportation from shore to a platform would be required for refueling, thus requiring further expended energy and emissions by transport vessels on a very frequent basis. Those additional emissions coupled with the additional emissions of combustion products (enrichment/pilot gas) as an alternative to just the VOC emissions from loading operations alone could outweigh the benefits of a VCU installation. It is also uncertain how reliably propane could be transported to such remote locations at sea at the frequent intervals which would be required, leading to potential significant delays in operations which could further exacerbate emissions if tanker vessels have to spend extra time "jogging" engines at sea while waiting to receive loads of crude oil once a depleted propane supply is replenished for VCU operation.

- A vapor gas blower would be required to transfer vapor from the crude oil tanker back to the VCU on a platform. The size/power of the blower needed for a VLCC would be multitudes larger than any installation known to currently be used on a VLCC. An installation of this magnitude would require a great deal of research and design since it has not already been demonstrated. In addition, the blower would require electrical energy from shore, or generation using a gas turbine. If placed on the platform, storage of fuel would be required (propane or liquid fuels). A significant footprint and equipment cost would be associated with this option.

- A vapor collection system would be required that returns collected vapors back to the SPM buoy, down to a subsea pipeline, and then to the VCU located on the platform. Such a vapor collection system has not been demonstrated and could present unique challenges due to the lengthy distance these vapor lines would have to traverse underwater to allow adequate clearance of the established swing circle around the SPM buoy which must accommodate ships that weathervane around it. An underwater vapor collection line traveling distances such as these could potentially lead to condensing vapors in the lines which would present operational reliability and safety issues.

- Vapor combustors or flares require a large thermal safety zone from other structures and personnel, due to being a large heat source. Such safety concerns could present unforeseen challenges in an offshore platform location where space is often limited/confined.

Based on the stated technical issues, VCU control technology is not an “applicable” technology for the proposed SPM buoy system and is, therefore, eliminated from consideration as a control option due to technically infeasibility and safety reasons.

Vapor Recovery Unit (VRU)

VRU control technology has been demonstrated as technically feasible in land-based applications, but not in offshore locations like the proposed SPM buoy system. The offshore location, weather conditions, and sea conditions present many challenges that render VRU control technology infeasible due to safety and energy concerns and is considered undemonstrated technology for offshore applications as discussed below:

- VRU control technology is not typically used for crude oil vapors due to the difficulties presented by the wide and variable range of compounds found in crude oils and their non-uniform chemical properties. For a condensation-based VRU system (compression/refrigeration), some of the chemicals in crude oil vapor would be condensed easily, but others would require either much greater compression power due to higher vapor pressures and/or more refrigeration power due to lower boiling points – this is especially true for chemicals such as ethane, propane, butane, and hydrogen sulfide. Similar difficulties are also encountered by adsorption/absorption systems, such as carbon adsorption systems, used to control emissions from crude oil vapors since lighter compounds are not well-controlled and the adsorption capacity is much less for these compounds. Many of the heavier compounds in crude oil vapors will sometimes “poison” the carbon requiring complete replacement. Certain compounds in crude oil will cause excessive heat generated by exothermic reactions resulting from capture on the carbon, potentially leading to fires/explosions, which are a great safety concern. Further, such systems have not yet been demonstrated on a scale the size of the proposed VLCC loading and in an offshore setting. Existing applications of VRU technology for crude oil have experienced little success and have limited availability.

- A vapor gas blower would be required to transfer vapor from the crude oil tanker back to the VRU on the platform. The size/power of the blower needed for a VLCC would be multitudes larger than any installation known to currently be used on a VLCC. An installation of this magnitude would require a great deal of research and design since it has not already been demonstrated. In addition, the blower would require electrical energy from shore, or generation using a gas turbine. If placed on the platform, storage of fuel would be required (propane or liquid fuels). A significant footprint and equipment cost would be associated with this option.

- A vapor collection system would be required that returns collected vapors back to the SPM buoy, down to a subsea pipeline, and then to the VRU located on the platform. Such a vapor collection system has not been demonstrated and could present unique challenges due to the lengthy distance these vapor lines would have to traverse underwater to allow adequate clearance of the established swing circle around the SPM buoy which must accommodate ships that weathervane around it. An underwater vapor collection line traveling distances such as these could potentially lead to condensing vapors in the lines, which would present operational reliability and safety issues.

Based on the stated technical difficulties, VRU control technology is not an "applicable" technology for the proposed SPM buoy system and is, therefore, eliminated from consideration as a technically infeasible control option.

Step 3: Rank Remaining Technically Feasible Control Options

The remaining two technically feasible control options in order of effectiveness are submerged loading and loading to ships that implement VOC Management Plans. Submerged loading achieves a control efficiency of more than 60% based on an evaluation of saturation factors found in AP-42 Table 5.2-1 (6/08). The control efficiency of loading to ships implementing VOC Management Plans is not easily quantifiable.

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

Submerged loading is the most effective remaining feasible control option and Texas GulfLink will implement this control option, so a cost analysis is not required. Loading to ships implementing VOC Management Plans is the baseline BACT option, so no further analysis of it is required.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of VOC from ship loading operations a combination of submerged fill loading and loading to ships that implement ship-specific VOC Management Plans in compliance with the requirements of MEPC.185(59).

5.4 Diesel Storage Tanks – VOC BACT

Steps 1 – 3: Identify and Rank Control Options

As required by Steps 1 – 3 of the top-down review, based on an RBLC database search, the following control options were identified for Diesel Storage Tank VOC emissions, ordered by effectiveness, and of which all are technically feasible:

- Fixed roof tank
- Submerged fill pipe
- Tank painted white
- Compliance with applicable regulatory work practices

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

Texas GulfLink will implement the above identified control technologies. Therefore, further analyses of economic, energy, and/or environmental impacts were not necessary.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of VOC from Diesel Storage Tanks a combination of fixed roof tanks, painted white, equipped with submerged fill pipes, and maintaining compliance with applicable regulatory work practices.

5.5 Surge Tank (Crude Oil Service) – VOC BACT

Steps 1 – 3: Identify and Rank Control Options

A search of the RBLC database for "surge" or "relief" tanks across all available types of industries yielded no results of BACT determinations dating back to January 2009. Surge/relief tanks are different from traditional storage tanks since they do not typically hold liquids during normal operations. These tanks will receive liquids only during a sudden surge event for which the tank will serve as "relief" and quickly receive the excess liquids for a brief period prior to being returned to the pipeline. The surge tank will not typically contain any crude oil. Due to the inherently low emissions due to the tank normally not containing stored material, Texas GulfLink conservatively identified the same control options for the Crude Oil Surge Tank as were identified for the Diesel Storage Tanks, ordered by effectiveness, and of which all are technically feasible:

- Fixed roof tank
- Submerged fill pipe
- Tank painted white
- Compliance with applicable regulatory work practices

The VCU and VRU control technologies previously described for ship loading would be considered technically infeasible for use on the crude surge tank, for the reasons already discussed. These control technologies would also be cost prohibitive for controlling the expected low emissions of less than 1.5 tons/yr VOC from the surge tank (see Table 3-1).

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

Texas GulfLink will implement all identified and technically feasible control technologies for VOC emissions from the Surge Tank and, therefore, further analyses of economic, energy, and/or environmental impacts were not necessary.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of VOC emissions from the Crude Oil Surge Tank a combination of fixed roof tank, painted white, equipped with submerged fill pipe, and maintaining compliance with applicable regulatory work practices.

5.6 Diesel Engines – VOC BACT

Generators, Cranes, and Firewater Pumps for the proposed Project will be driven by diesel-fired internal combustion engines. This section addresses VOC BACT controls for all of these emission sources.

Steps 1 – 3: Identify and Rank Control Options

As required by Steps 1 – 3 of the top-down BACT review, based on a RBLC database search, the following control options were identified for control of VOC emissions from Diesel Engines, ordered by effectiveness, and of which all are technically feasible:

- Oxidation Catalyst, 60% control efficiency
- Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ
- Good Combustion Practices

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

Oxidation Catalyst

The addition of a catalyst bed to the exhaust outlet of an engine causes significant pressure drop and backpressure to the engine. This reduces the power/energy efficiency of the engine. The oxidation catalyst causes reactions with CO and VOC in the exhaust further converting them to CO_2, which is released to the atmosphere as additional collateral emissions. The waste generated by spent catalyst must be replaced approximately every 5 years and disposed of potentially as a hazardous waste. Further, the cost of the Oxidation Catalyst for the proposed generators would be prohibitive, at approximately $211,000/ton (see Appendix D for details of the cost analysis). This cost is based on the conservative assumption of year-round (i.e., 8,760 hrs/yr) operation of each unit, which would not actually be the case. Because typically only one of the two Generator engines (with two oxidation catalyst beds) would be in use, each Generator would have a half-year operating factor, on average, when considering combined run-time of both units. So, the actual cost would be approximately $422,000/ton of VOC reduced. These adverse environmental and economic impacts outweigh the advantages, so installing Oxidation Catalysts is rejected as a VOC control option for all of the diesel-fired engines.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of VOC from Diesel Engines a combination of good combustion practices and compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ.

5.7 Diesel Engines – NOx BACT

Generators, Cranes, and Firewater Pumps for the proposed project will be driven by diesel-fired internal combustion engines. This section addresses NOx BACT controls for all of these emission sources.

Step 1: Identify Available Control Options

The following control options are the identified available control options for Step 1 of the top-down BACT review based on an RBLC database search:

- Fuel Selection
- Add-on controls such as Selective Catalytic Reduction (SCR), Selective Non-Catalytic Reduction (SNCR), or Non-Selective Catalytic Reduction (NSCR)
- Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ
- Good Combustion Practices

Step 2: Eliminate Technically Infeasible Control Options

Fuel Selection

Natural gas-fired engines can provide for lower NOx emissions performance as compared to diesel-fired engines. As previously discussed related to complexities with a VCU for ship loading, no fuel gas pipeline, such as a natural gas or propane pipeline, would be readily present in the remote offshore location of the proposed project. Therefore, natural gas-fired engines would require significant storage of the fuel on the platform, creating the same reliability issues as previously discussed for a VCU. Diesel fuel can be more reliably and efficiently transported (from an energy and emissions perspective) to the offshore location. For these reasons, fuel selection is a technically infeasible control option. Diesel fuel is proposed for the engines.

Add-on Controls Such as SCR, SNCR, or NSCR

SCR technology normally is effective for treating flue gases in the temperature range of approximately 450°F to 850°F and it requires stable temperatures with sustained run times for effective NOx emissions control. The crane and firewater pump engines will typically run for only several hours per week and/or with frequent load fluctuations causing unstable stack temperatures. For these reasons, SCR is eliminated from further consideration as a technically feasible NOx control option for the crane and firewater pump engines. For the generator engines, which will experience more sustained run times, SCR will be further evaluated as a potential technically feasible NOx control option.

SNCR technology is normally effective for treating flue gases in the temperature range of approximately 1,600°F to 1,900°F. Engines typically have maximum exhaust manifold temperatures well below the usual effective operating range of SNCR, reaching up to approximately 1,100°F. For this reason, SNCR is eliminated from consideration as a technically feasible control option.

To be effective, NSCR technology requires a fuel-rich vapor stream with very low oxygen content. Diesel engines inherently operate "lean" with higher oxygen and lean levels of fuel in the exhaust. Therefore, NSCR is not effective for NOx reduction in diesel engine exhaust, and is eliminated from consideration as a technically feasible NOx control option.

Step 3: Rank Remaining Technically Feasible Control Options

The remaining technically feasible control options in order of effectiveness are:

- SCR (Generator engines only)
- Compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ
- Good Combustion Practices

Step 4: Reject Control Options based on Economic, Energy, and/or Environmental Impacts

<u>SCR (generators only)</u>
SCR technology creates collateral emissions of ammonia requiring injection of ammonia or urea into the exhaust stream upstream of the catalyst. Some of the ammonia passes through unreacted which is known as "ammonia slip". Another adverse environmental impact is the waste generated by spent catalyst from the SCR unit which must be replaced, for typical operations, approximately every three years and disposed of as a hazardous waste. Storing ammonia on the offshore platform and the ammonia slip from the SCR unit would create safety concerns for the personnel in close proximity (i.e., those living on the platform) since ammonia is toxic and can cause irritation and burning of the skin, eyes, nose, and throat. Further, the cost of SCR technology for the proposed Generators would be prohibitive, at approximately $11,000/ton (see Appendix D for details of the cost analysis). This cost is based on the conservative assumption of year-round (i.e., 8,760 hrs/yr) operation of each unit, which would not actually be the case. Because typically only one of the two generators (with two SCR units) would be in use, each generator would have a half-year operating factor, on average, when considering the combined run-time of both units. So, the actual cost would be approximately $22,000/ton of VOC reduced. Based on these health, environmental, and economic reasons, SCR is rejected as a feasible control option for NOx emissions from the Generators because these disadvantages are deemed to outweigh any benefit.

Step 5: Select BACT

Texas GulfLink proposes as BACT for control of NOx emissions from the Generator diesel engines a combination of good combustion practices and compliance with applicable requirements of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ.

6.0 REGULATORY APPLICABILITY

In this section, potentially applicable federal and state air regulations are reviewed for the proposed Texas GulfLink Deepwater Port Facility. Note that the US Environmental Protection Agency (EPA) does not normally administer the Clean Air Act (CAA) in the western Gulf of Mexico because under CAA Section 328, the Department of Interior's Bureau of Ocean Energy Management (BOEM) is responsible for regulating outer continental shelf (OCS) sources, as defined by the OCS Lands Act, in that area. However, because the proposed Deepwater Port Facility will not be a defined OCS source, Section 328 does not apply. Instead, the EPA is the CAA permitting authority for non-OCS sources in federal waters.

The EPA regards a provision of the Deepwater Port Act (DPA), 33 U.S.C. §1501, *et seq,* as the primary source of its authority to apply the CAA to activities associated with deepwater ports. The DPA applies federal law, and applicable State law, to deepwater ports and further designates deepwater ports as "new sources" for CAA purposes. Accordingly, for the source's pre-construction and operating permits, EPA will rely on the provisions of Title I and Title V, respectively, of the CAA supporting applicable regulations, and on the State's law to the extent applicable and not inconsistent with federal law.

Section 6.1 below describes the potentially applicable federal air regulations in Title 40 of the Code of Federal Regulations (40 CFR). Section 6.2 below describes the potentially applicable Texas air regulations in Title 30 of the Texas Administrative Code (30 TAC), as administered by the Texas Commission on Environmental Quality (TCEQ).

6.1 Federal Air Regulations – 40 CFR

The federal air regulations reviewed include New Source Performance Standards (NSPS) in 40 CFR Part 60, National Emission Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR Part 61, and NESHAP for Source Categories (which outlines Maximum Achievable Control Technology, "MACT") in 40 CFR Part 63. Note that the applicability of 40 CFR Parts 70/71 (federal Title V) is included under separate cover.

NSPS – 40 CFR Part 60

<u>Subpart A: General Provisions</u>
Any emission source subject to a specific NSPS is also subject to applicable general provisions in this subpart. Unless specifically excluded by the source-specific NSPS, Subpart A generally requires initial construction notification, initial startup notification, performance tests/notifications, general monitoring requirements, general recordkeeping requirements, and semi-annual monitoring and/or excess emission reports. Because the proposed Texas GulfLink Deepwater Port Facility will be subject to one or more source-specific NSPS, the facility will comply with the applicable general provisions under Subpart A.

Subparts D, Da, Db, Dc: Steam Generating Units

The proposed Deepwater Port Facility will not operate a defined steam generating unit (SGU). Therefore, these rules that apply to SGUs do not apply.

Subparts Kb: Petroleum Liquid Storage Vessels Constructed, Reconstructed, or Modified after July 23, 1984

This subpart applies to a storage vessel with a capacity greater than or equal to 20,000 gallons that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification commenced after July 23, 1984. However, the subpart does not apply to a storage vessel with a capacity greater than or equal to 40,000 gallons storing a liquid with a maximum true vapor pressure (TVP) less than 0.5 psia, or with a capacity between 20,000 and 40,000 gallons storing a liquid with a maximum TVP less than 2.2 psia.

Although the proposed crude surge tank at the Deepwater Port Facility [EPN (P) T-1] will have a capacity greater than 40,000 gallons, it will not be operated as a storage tank. Surge/relief tanks are different from traditional storage tanks since they do not typically hold liquids during normal operations. Such tanks will receive liquids only during a sudden surge event for which the tank will serve as "relief" and quickly receive the excess liquids for a brief period prior to being returned back to the pipeline. The surge tank will not typically contain any crude oil. Therefore, this subpart does not apply to the surge tank. Additionally, the two proposed diesel-fuel storage tanks [EPNs (P) DT-1 and (P) DT-2] will each have a storage capacity of 20,000 gallons, but the TVP of diesel is significantly less than 2.2 psia. Therefore, the two diesel-fuel tanks will also not be subject to this rule.

Subpart GG: Gas Turbines

The proposed Deepwater Port Facility will not operate a stationary gas turbine. Therefore, this rule does not apply.

Subpart IIII: Stationary Compression Ignition IC Engines

This subpart applies to compression ignition (CI) engines. There will be a total of six CI engines located at the Deepwater Port Facility driving: two electric generators, two emergency firewater pumps, and two portal cranes. All six engines will be constructed after the applicable date of July 11, 2005. Therefore, the Deepwater Port Facility will comply with the applicable provisions of this subpart for the six CI engines.

Subpart JJJJ: Stationary Spark Ignition IC Engines

This subpart applies to spark ignition (SI) engines. The proposed Deepwater Port Facility will not operate any SI engines. Therefore, this rule does not apply.

Subpart KKKK: Stationary Combustion Turbines

The proposed Deepwater Port Facility will not operate a stationary combustion turbine. Therefore, this rule does not apply.

NESHAP – 40 CFR Part 61

Subpart A: General Provisions

Any emission source subject to a specific NESHAP is also subject to applicable general provisions in this subpart. The proposed Deepwater Port Facility will have emissions of benzene as a result of handling and storing crude oil. Benzene is a listed applicable substance in 40 CFR 61.01(a). Therefore, a review of potentially applicable NESHAP rules was performed for the facility's emission sources.

Subpart V: Equipment Leaks of VHAP Service

The crude to be handled and loaded at the proposed Deepwater Port Facility will contain benzene at less than 10% by weight. As such, the pipeline components regulated by this subpart (e.g. valves, connectors, pumps, pressure relief devices, sampling connection systems, etc.) will not operate "In VHAP Service", as defined in 40 CFR 61.241. Therefore, this subpart does not apply. As there are no other applicable NESHAP rules that apply to the Deepwater Port Facility, Subpart A does not apply as well.

NESHAP for Source Categories ("MACT") – 40 CFR Part 63

Subpart A: General Provisions

This subpart applies to any facility that is subject to an individual subpart under 40 CFR 63. Because the diesel (compression ignition) engines at the proposed Deepwater Port Facility will be subject to Subpart ZZZZ, the facility will comply with applicable requirements in Subpart A.

Subpart H: Equipment Leaks of Organic HAPs

The provisions of this subpart apply to pumps, compressors, agitators, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, instrumentation systems, and control devices or closed vent systems required by this subpart that are intended to operate in organic HAP service 300 hours or more during the calendar year within a source subject to the provisions of a specific subpart in 40 CFR part 63 that references this subpart. No Part 63 subpart that applies to the Deepwater Port Facility references this Subpart H. Additionally, the facility will not operate pipeline components "In Organic HAP" service (i.e., piece of equipment either contains or contacts a fluid that is at least 5% by weight of total organic HAP). Therefore, this subpart does not apply.

Subpart Y: National Emission Standards for Marine Tank Vessel Loading Operations

The proposed Deepwater Port Facility is expected to emit greater than 10 tons per year (tpy) of a single hazardous air pollutant (HAP) and greater than 25 tpy of an aggregate of all speciated HAPs (see Table 3-2). Therefore, the facility is considered a major source of HAPs. For some marine tank vessel loading operations, 40 CF Part 63, Subpart Y provides the regulatory framework for setting HAPs emissions limits. However, for the reasons stated below and in Appendix E to this application, 40 CFR Part 63, Subpart Y does not apply to Texas GulfLink's application or proposed Deepwater Port Facility. If the rule did apply, applicable MACT standards in §63.562(b) could apply, which standards include a requirement to reduce HAP emissions from marine tank vessel loading by 95% by weight using methods in §63.565(d) and (l). 40 CFR §63.565(d) refers to "combustion (except flare) and recovery control device performance test procedures" (e.g. vapor combustion unit, VCU). The control device likely required would be a vapor collection system with a VCU, if Subpart Y applied.

The Clean Air Act Amendments of 1990 required the US EPA to regulate emissions of HAPs using technology-based standards. The Section 112 standards are known as the National Emissions Standards for Hazardous Air Pollutants (NESHAPs), and are commonly referred to as Maximum Achievable Control Technology, or MACT, standards. When developing a MACT standard for a particular source category, US EPA evaluates the level of emissions currently being achieved by the best-performing similar sources through use of HAP-compliant materials, clean processes, control devices, work practices, or other methods. These emissions levels set a baseline (referred to as the "MACT floor") for the new standard. At a minimum, a MACT standard must achieve, throughout the industry, a level of emissions control that is at least equivalent to the MACT floor. The MACT floor is established differently for *existing* sources and *new* sources (which are defined based on the date when a NESHAP is proposed):

- For *existing* sources, the MACT floor must equal the average emissions limitations currently achieved by the best-performing 12% of sources in that source category, if there are 30 or more existing sources. If there are fewer than 30 existing sources, then the MACT floor must equal the average emissions limitation achieved by the best-performing five sources in the category.

- For *new* sources, the MACT floor must equal the level of emissions control currently achieved by the best-controlled similar source.

Vapor collection and control technologies have been demonstrated as technically feasible in land-based applications of VOC vapor control, but not in offshore locations like the proposed Texas GulfLink Deepwater Port Facility, which will involve marine loading via two Single Point Mooring (SPM) buoy systems. The offshore location and associated operational conditions, weather conditions, and sea conditions present many challenges that render these control technologies technically infeasible due to safety and operational concerns, and these technologies are considered undemonstrated for offshore applications. In other words, these technologies do not meet the MACT floor because they do not represent a "currently achieved" level of emissions control for offshore marine loading operations. The only currently achieved level of emissions control is submerged fill loading into ships that implement a VOC Management Plan, per MEPC.185(59) and the supplement MEPC.1/Circ.680. Appendix E of this application is a 40 CFR 63 Subpart Y applicability evaluation that provides more detail on why Texas GulfLink, LLC believes this rule does not apply to the proposed Texas GulfLink Project based on safety and operational reasons.

Subpart VV: Oil-Water Separators and Organic-Water Separators

The provisions of this subpart apply to the control of air emissions from oil-water separators and organic-water separators for which another subpart of 40 CFR 60, 61, or 63 references the use of this subpart for such air emission control. No Part 60, 61, or 63 subpart that applies to the proposed Deepwater Port Facility references Subpart VV. In addition, the facility will not operate an affected source under Subpart VV. Therefore, this rule does not apply.

Subpart YYYY: Stationary Combustion Turbines

The proposed Deepwater Port Facility will not operate a stationary combustion turbine. Therefore, this rule does not apply.

Subpart ZZZZ: Stationary Reciprocating Internal Combustion Engines (RICE)

The proposed Deepwater Port Facility will operate six compression ignition (CI) engines driving two electric generators (350 KW), two emergency firewater pumps (350 bhp), and two portal cranes (439 KW). Per 40 CFR 63.6590(c), an affected source that meets any of the criteria in paragraphs (c)(1) through (7) of the section must meet the requirements of Subpart ZZZZ by meeting the requirements of 40 CFR 60 Subpart IIII for compression ignition engines, and no further requirements apply under this subpart.

The two emergency-use firewater pump engines [EPNs (P) FWP-1 and (P) FWP-2] meet the applicability criteria of paragraph (c)(6) because they will be new emergency stationary reciprocating internal combustion engines (RICE) with a site rating of less than or equal to 500 brake horsepower (bhp) each located at a major source of hazardous air pollutant (HAP) emissions. Therefore, these engines will comply with Subpart ZZZZ by complying with 40 CFR 60 Subpart IIII, and no further requirements under Subpart ZZZZ apply.

Additionally, the two electric generator engines [EPNs (P) G-1 and (P) G-2] and two portal crane engines [EPNs (P) C-1 and (P) C-2] meet the applicability criteria of paragraph (c)(7) because they will be new CI stationary RICE with a site rating of less than or equal to 500 bhp located at a major source of HAP emissions. Therefore, these engines will comply with Subpart ZZZZ by complying with 40 CFR 60 Subpart IIII, and no further requirements under Subpart ZZZZ apply.

6.2 Texas Air Regulations – 30 TAC

As previously mentioned, for deepwater port license applications, the US EPA administers CAA requirements and reviews air permit applications using the adjacent State’s regulations. Because Texas is the nearest adjacent state to the proposed Deepwater Port Facility, the TCEQ rules and regulations would potentially apply to the Deepwater Port Facility. The TCEQ air quality regulations in 30 TAC Chapters 101 through 122 were reviewed for potentially applicable requirements.

Chapter 101: General Air Quality Rules

Chapter 101 covers general rules that may apply to the Deepwater Port Facility. Some items included in Chapter 101 are nuisance rules, inspection fees, emission fees, emission events, scheduled maintenance, and expedited permitting. The proposed Deepwater Port Facility will comply with applicable requirements listed in this chapter.

Chapter 111: Control of Air Pollution from Visible Emissions and Particulate Matter

Chapter 111 establishes standards for visible emissions and opacity from stationary vents, gas flares, ships, and other sources, and for particulate matter (PM) emissions from selected sources, including material handling and construction. In general, the opacity from a new stationary vent or stack must not exceed 20%, averaged over a 6-minute period. The opacity from a ship stack must not exceed 30%, averaged over a 5-minute period, except during reasonable periods of engine startup. Gas flares must not have visible emissions for more than 5 minutes in any consecutive 2-hour period. The Deepwater Port Facility will comply with applicable opacity and PM emission limits specified in this chapter.

Chapter 112: Control of Air Pollution from Sulfur Dioxide

Chapter 112 outlines emission limits as well as monitoring, reporting, recordkeeping requirements, and net ground-level concentration limits for sulfur compounds. The proposed Deepwater Port Facility will demonstrate compliance with the net ground-level concentration of applicable sulfur compounds (e.g. SO_2, H_2S) through air dispersion modeling analysis.

Chapter 113: Standards of Performance for Hazardous Air Pollutants and for Designated Facilities and Pollutants

Chapter 113 incorporates by reference the federal NESHAP standards contained in 40 CFR Part 63. The applicability analysis for the federal NESHAP regulations is presented in Section 6.1.

Chapter 115: Control of Air Pollution from Volatile Organic Compounds

Chapter 115 establishes rules for VOC emissions from specific sources, including vent gases, loading, and unloading of VOCs. Chapter 115 applies to emission sources located in designated nonattainment counties, and specific covered attainment counties listed in §115.10. The requirements listed in Chapter 115 do not apply to the proposed Deepwater Port Facility because the facility will not be located in a designated nonattainment area, nor in one of the specifically listed attainment counties.

Chapter 116: Control of Air Pollution by Permits for New Construction or Modification

Through Chapter 116, the TCEQ administers the New Source Review (NSR) air permitting programs in Texas, including NNSR and PSD. However, for sources located on the OCS outside of the state seaward boundary, the US EPA administers the PSD (pre-construction) program, using adjacent state regulations. Therefore, Texas GulfLink is applying to the US EPA (Region 6) for a PSD permit prior to commencing construction.

Chapter 117: Control of Air Pollution from Nitrogen Compounds

Chapter 117 Subchapter B establishes emission limits for nitrogen compounds emitted from major industrial, commercial, and institutional sources located in ozone nonattainment areas. Because the proposed Deepwater Port Facility will not be located in a designated nonattainment area, the requirements of this chapter to not apply.

Chapter 118: Control of Air Pollution Episodes

Chapter 118 establishes requirements for generalized and local air pollution episodes. The requirements listed in Chapter 118 do not apply to the proposed Deepwater Port Facility because the facility's location will not be in any geographical area that might be affected by an air pollution episode.

Chapter 122: Federal Operating Permits Program

The proposed Texas GulfLink Deepwater Port Facility will be a major source of regulated pollutants (i.e., single pollutant with emissions greater than 100 tons per year, see Table 3-1); thus, it will require a federal Title V operating permit. For sources located on the OCS outside of the state seaward boundary, the US EPA administers the Title V permit program, using adjacent state regulations. Therefore, the Deepwater Port Facility is required to submit an initial Title V operating permit application to the US EPA (Region 6) prior to starting operation of the facility. This Title V permit application is included under separate cover.

7.0 AIR QUALITY IMPACTS ANALYSES

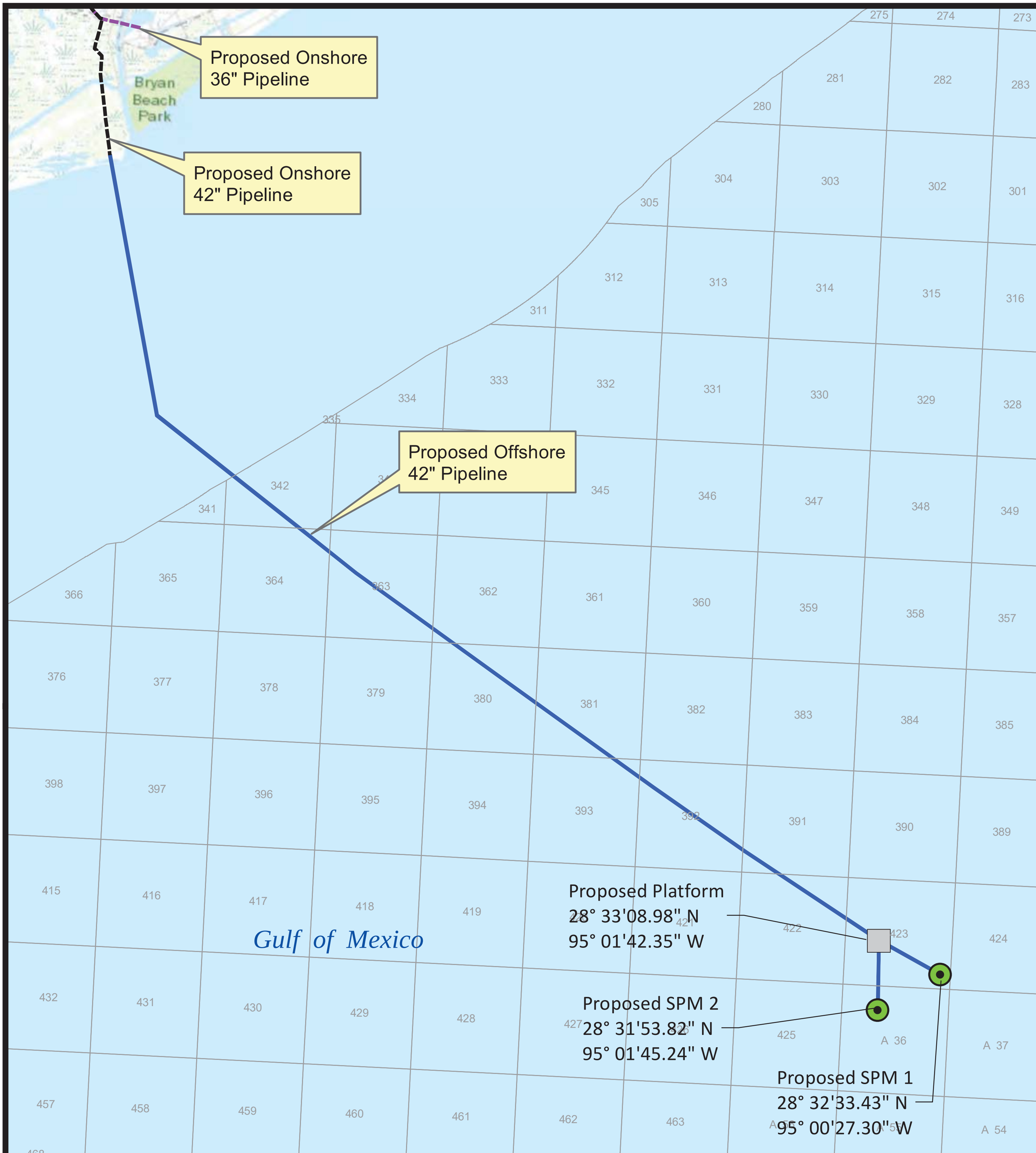
As described in Section 4.0 of this application, because the proposed offshore Deepwater Port Facility will have emissions of NOx and VOC that trigger PSD applicability, the following PSD air quality analyses were reviewed:

- Pre-application PSD significance modeling, per §52.21(m);
- Off-property impacts analysis, demonstrating compliance with the National Ambient Air Quality Standard (NAAQS) and maximum allowable increase over the baseline concentration in the area ("increment"), per §52.21(k);
- An additional impact analysis, per §52.21(o); and
- A federal Class I Area impact analysis, per §52.21(p).

Appendix F presents a report describing the air quality analyses performed for the proposed Texas GulfLink Deepwater Port Facility (i.e., a major new source) following the PSD requirements. These analyses include dispersion modeling using the BOEM-accepted Offshore and Coastal Dispersion (OCD) model, an ozone impacts review considering the two precursor pollutants to ozone formation, NOx and VOC, and a visibility screening analysis for the nearest Class II area (San Bernard Wildlife Refuge). Note that a Class I area impacts review was not required because the nearest Class I area (Breton National Wildlife Refuge in southeast Louisiana) is too far away to trigger such a review.

APPENDICES

Appendix A
Application Figures (Area Map, Simplified PFD)



Texas GulfLink, LLC
Dallas, Texas

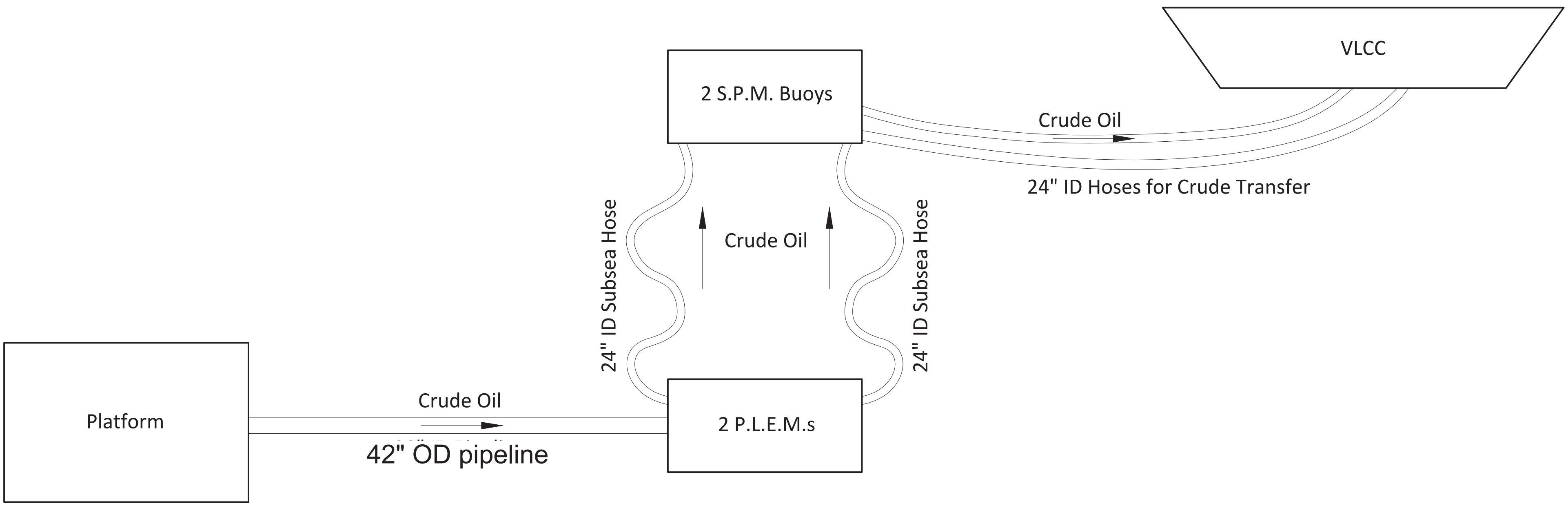
Texas GulfLink

Offshore Location Map

N

0 3
Miles

Drawn:	CAL	Checked:	JLS
Date:	5/7/2019	Approved:	JLS
Dwg. No.:	A17073-60	**Figure 1**	



Texas GulfLink, LLC Dallas, Texas					
Texas GulfLink **Simplified Process Flow Diagram**					
N	NOT TO SCALE	Drawn: CPL		Checked: JLS	
		Date: 05/09/19		Approved: JLS	
		Dwg. No.: A17073-62		**Figure 2**	

Appendix B
Detailed Emission Rate Calculations

	CO_2e	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO	Total VOC	H_2S	Benzene	Isopropyl benzene	Ethylbenzene	Formaldehyde	Hexane (-n)	2,2,4-Trimethylp (isooctane)
	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)
							10,016.56	0.08	110.47	0.846	7.41		118.37	9.51
	2413	0.76	0.76	4.76	14.12	13.36	1.15					0.02		
	2413	0.76	0.76	4.76	14.12	13.36	1.15					0.02		
	1998	0.85	0.85	5.29	15.68	14.84	1.27					0.02		
	1998	0.85	0.85	5.29	15.68	14.84	1.27					0.02		
							0.01							
							0.01							
							2.91		0.02	0.000	0.00		0.02	0.000
	20	0.01	0.01	0.04	0.11	0.10	0.01							
	20	0.01	0.01	0.04	0.11	0.10	0.01							
							0.26		0.003				0.003	
ons							0.05							
							0.44							
							0.05							
							0.002							
(TPY)	**8,862**	**3.23**	**3.23**	**20.16**	**59.82**	**56.59**	**10,025.14**	**0.08**	**110.49**	**0.85**	**7.41**	**0.07**	**118.39**	**9.51**

Texas GulfLink, LLC
Offshore Platform
Marine Loading

EPN	Description
(P) M-1	Marine Loading

AP-42, Chapter 5, Section 5.2
Transportation and Marketing of Petroleum Liquids
Equation 2 was developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges

$C_L = C_A + C_G$
C_L = total loading loss (lb/10^3 gal of crude oil loaded)

C_A = arrival emission factor (lb/10^3 gal loaded)

C_A =	0.86	Taken from Table 5.2-3, based on "Uncleaned" and "Volatile", assumes no ballasting. Vapor pressure is > 1.5 psia.

C_G = generated emission factor (lb/10^3 gal loaded)
C_G = 1.84*(0.44P-0.42)*((MG)/T)

P =	6.69	psia	Average true vapor pressure for Crude Oil estimated using TANKS 4.09d and information provided by Abadie-Williams LLC
P =	7.30	psia	Maximum true vapor pressure for Crude Oil estimated using AP-42, Figure 7.1-13 and information provided by Abadie-Williams LLC
M =	50	lb/lb-mol	VMW of loaded crude
G =	1.02	dimensionless	AP-42
T =	529.67	deg R	Average temperature of loaded crude provided by Abadie-Williams LLC.
T =	539.67	deg R	Maximum temperature of loaded crude provided by Abadie-Williams LLC
C_G =	0.45	**ANNUAL EMISSION FACTOR**	
C_G =	0.49	**MAXIMUM EMISSION FACTOR**	

ANNUAL
C_L = 1.31 lb/10^3 gal loaded
MAXIMUM
C_L = 1.35 lb/10^3 gal loaded

Pollutant	Maximum Emission Factor (lb/10^3 gal)	Annual Emission Factor (lb/10^3 gal)	Maximum Crude Loading Rate (bbl/hr)	Annual Crude Loaded (bbl/yr)	MW (lb/lbmol)	Average Concentration of H_2S in Crude (ppmv)	Maximum Concentration of H_2S in Crude (ppmv)	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
VOC	1.35	1.31	85,000	365,000,000	-	-	-	2,286.89	4,803.38	10,016.56
Benzene	-	-	-	-	-	-	-	25.22	52.97	110.47
Ethylbenzene	-	-	-	-	-	-	-	1.69	3.55	7.41
n-Hexane	-	-	-	-	-	-	-	27.02	56.76	118.37
Isooctane	-	-	-	-	-	-	-	2.17	4.56	9.51
Isopropyl benzene	-	-	-	-	-	-	-	0.19	0.41	0.85
Toluene	-	-	-	-	-	-	-	12.35	25.93	54.07
Xylene	-	-	-	-	-	-	-	4.95	10.39	21.68
H_2S	-	-	-	-	34.1	5	25	0.02	0.16	0.08

Maximum and Annual Crude Loading Rates provided by Abadie-Williams LLC
Maximum and Annual Concentration of H_2S in Crude is an assumption.

From TANKS 4.09d:

NAME	V_WT_FRACT
Benzene	0.0110
Ethylbenzene	0.0007
Hexane (-n)	0.0118
Isooctane	0.0009
Isopropyl benzene	0.0001
Toluene	0.0054
Xylene (-m)	0.0022
Unidentified Components	0.9544
Cyclohexane	0.0133
1,2,4-Trimethylbenzene	0.0001

Texas GulfLink, LLC
Offshore Platform
Generators

Two (2) 350 KW generators are used to supply electricity to the platform.

EPN	Description
(P) G-1	Generator 1
(P) G-2	Generator 2

Given:

Power Output of Each Generator	350	KW(1)
Power Output of Each Engine	530	Hp
Power Output of Each Engine	395.23	KW(2)
Operation Time	8,760	hrs
Firing Rate:	3.71	MMBtu/hr(3)

Calculation Methodology:
Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation for One Engine:

Pollutant	Emission Factor(4) [g/kW-hr]	Emission Factor(2) [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
$PM_{2.5}$	0.2	0.15	0.000	NSPS 4I	0.17	0.17	0.76
PM_{10}	0.2	0.15	0.000	NSPS 4I	0.17	0.17	0.76
SO_2	-	-	0.002	AP-42, Ch. 3.3	1.09	1.09	4.76
CO	3.5	2.61	0.01	NSPS 4I	3.05	3.05	13.36
NMHC + NOx	4.00	-	-	NSPS 4I	-	-	-
NO_x	3.70	2.76	0.01	NSPS 4I	3.22	3.22	14.12
Total VOC	0.30	0.22	0.000	NSPS 4I	0.26	0.26	1.15

Greenhouse Gases Emission Calculation for One Engine:

Pollutant	Emission Factor(5) (kg/MMBtu)	Global Warming Potentials(6)	Emissions Average(7) (lb/hr)	Maximum (lb/hr)	Annual (tpy)	CO_2e(8) (tonnes/yr)
CO_2	73.96	1	604.93	604.93	2649.59	2404.35
CH_4	3.00E-03	25	0.02	0.02	2.69	2.44
N_2O	6.00E-04	298	0.005	0.005	6.41	5.81
CO_2e	--	--	604.96	604.96	2658.68	2412.60

Toxic Air Pollutant Emission Calculation for One Engine:

Pollutant	Emission Factor [lb/MMBtu]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Formaldehyde	0.00118	AP-42, Ch. 3.3	0.004	0.004	0.019

Notes:
(1) Provided by Abadie-Williams LLC
(2) 1.341 hp/Kw
(3) Converted using 7,000 Btu/hp-hr from AP-42, Chapter 3.
(4) NMHC + NOx, CO, and PM taken from 40 CFR 89.112(a) Table 1; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NOx factor used for VOC and NOx by assuming 92% NOx and 8% VOC, based on the ratios of NOx and VOC AP-42 emission factors in Chapter 3.3.
(5) All emission factors taken from Tables C-1 and C-2 to Subpart C of Part 98. Distillate Fuel Oil No. 2 for CO_2 emission factor, Petroleum (all fuel type in Table C-1) for CH_4 and N_2O emission factors.
(6) Global warming potentials for converting to CO_2e taken from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.
(7) Emissions converted from kg to lbs using 2.20462 lb/kg.
(8) CO_2e tonnes calculated using 2,204 lbs/tonne and global warming potentials from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

Texas GulfLink, LLC
Offshore Platform
Portal Cranes

Two (2) 439 KW portal cranes are used on the platform.

EPN	Description
(P) C-1	Crane 1
(P) C-2	Crane 2

Given:

Power Output of Each Engine	439.00	KW[(1)]
Power Output of Each Engine	588.70	Hp[(2)]
Operation Time	8,760	hrs
Firing Rate:	3.07	MMBtu/hr[(3)]

Calculation Methodology:

Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation for One Engine:

Pollutant	Emission Factor[(4)] [g/kW-hr]	Emission Factor[(2)] [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
$PM_{2.5}$	0.2	0.15	0.000	NSPS 4I	0.19	0.19	0.85
PM_{10}	0.2	0.15	0.000	NSPS 4I	0.19	0.19	0.85
SO_2	-	-	0.002	AP-42, Ch. 3.3	1.21	1.21	5.29
CO	3.5	2.61	0.01	NSPS 4I	3.39	3.39	14.84
NMHC + NOx	4.00	-	-	NSPS 4I	-	-	-
NO_x	3.70	2.76	0.01	NSPS 4I	3.58	3.58	15.68
Total VOC	0.30	0.22	0.000	NSPS 4I	0.29	0.29	1.27

Greenhouse Gases Emission Calculation for One Engine:

Pollutant	Emission Factor[(5)] (kg/MMBtu)	Global Warming Potentials[(6)]	Emissions Average[(7)] (lb/hr)	Maximum (lb/hr)	Annual (tpy)	CO_2e[(8)] (tonnes/yr)
CO_2	73.96	1	501.06	501.06	2194.66	1991.52
CH_4	3.00E-03	25	0.02	0.02	2.23	2.02
N_2O	6.00E-04	298	0.004	0.004	5.31	4.81
CO_2e	--	--	501.09	501.09	2202.19	1998.36

Toxic Air Pollutant Emission Calculation for One Engine:

Pollutant	Emission Factor [lb/MMBtu]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Formaldehyde	0.00118	AP-42, Ch. 3.3	0.004	0.004	0.016

Notes:
(1) Assumption
(2) 1.341 hp/Kw
(3) Converted using 7,000 Btu/hp-hr from AP-42, Chapter 3.
(4) NMHC + NOx, CO, and PM taken from 40 CFR 89.112(a) Table 1; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NOx factor used for VOC and NOx by assuming 92% NOx and 8% VOC, based on the ratios of NOx and VOC AP-42 emission factors in Chapter 3.4. Assumes Tier III.
(5) All emission factors taken from Tables C-1 and C-2 to Subpart C of Part 98. Distillate Fuel Oil No. 2 for CO_2 emission factor, Petroleum (all fuel type in Table C-1) for CH_4 and N_2O emission factors.
(6) Global warming potentials for converting to CO_2e taken from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.
(7) Emissions converted from kg to lbs using 2.20462 lb/kg.
(8) CO_2e tonnes calculated using 2,204 lbs/tonne and global warming potentials from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

Texas GulfLink, LLC
Offshore Platform
Diesel Fuel Tanks for Engines

Tank Data:

EPN	Description	Tank Type	Stored Product	Annual Operating Hours	Volume (gal)	Annual Throughput (gal/yr)
(P) DT-1	Day Tank 1	Vertical Fixed Roof	Diesel	8,760	20,000	300,000
(P) DT-2	Day Tank 2	Vertical Fixed Roof	Diesel	8,760	20,000	300,000

Calculation Methodology:
Note: Emissions are based on AP-42, Chapter 7, November 2006.
Average Hourly Rate [lb/hr] = TANKS Emission Report (lb/yr) / 8760 hrs/yr
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = TANKS Emission Report (lb/yr) / 2000 lb/ton

Emission Calculation for One Tank:

Pollutant	VOC Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	11.04	0.001	0.001	0.01
Benzene	0.02	2.E-06	2.E-06	1.E-05
Ethylbenzene	0.04	4.E-06	4.E-06	2.E-05
n-Hexane	0.00	5.E-07	5.E-07	2.E-06
Toluene	0.25	0.00003	0.00003	0.0001
Xylenes	0.66	0.0001	0.0001	0.0003

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification	
User Identification:	(P) DT-1
City:	Freeport
State:	Texas
Company:	Sentinel Midstream
Type of Tank:	Vertical Fixed Roof Tank
Description:	Day Tank 1 (Diesel for Engine)
Tank Dimensions	
Shell Height (ft):	20.00
Diameter (ft):	13.00
Liquid Height (ft) :	20.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	20,000.00
Turnovers:	15.00
Net Throughput(gal/yr):	300,000.00
Is Tank Heated (y/n):	N
Paint Characteristics	
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good
Roof Characteristics	
Type:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.06
Breather Vent Settings	
Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

(P) DT-1 - Vertical Fixed Roof Tank
Freeport, Texas

		Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp	Vapor Pressure (psia)			Vapor Mol.	Liquid Mass	Vapor Mass	Mol.	Basis for Vapor Pressure
Mixture/Component	Month	Avg.	Min.	Max.	(deg F)	Avg.	Min.	Max.	Weight.	Fract.	Fract.	Weight	Calculations
Distillate fuel oil no. 2	All	71.54	68.18	74.90	69.66	0.0095	0.0085	0.0105	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
1,2,4-Trimethylbenzene						0.0320	0.0282	0.0363	120.1900	0.0100	0.0490	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5948	1.4590	1.7409	78.1100	0.0000	0.0020	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.1604	0.1435	0.1790	106.1700	0.0001	0.0032	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5633	2.3578	2.7832	86.1700	0.0000	0.0004	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4684	0.4239	0.5168	92.1300	0.0003	0.0229	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.0081	0.0074	0.0079	134.5138	0.9866	0.8632	189.60	
Xylene (-m)						0.1341	0.1198	0.1498	106.1700	0.0029	0.0594	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

(P) DT-1 - Vertical Fixed Roof Tank
Freeport, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	2.2505
Vapor Space Volume (cu ft):	1,345.2971
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0213
Vented Vapor Saturation Factor:	0.9949
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,345.2971
Tank Diameter (ft):	13.0000
Vapor Space Outage (ft):	10.1354
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.1354
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.1354
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	6.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0213
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.0019
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0085
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0105
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9949
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0095
Vapor Space Outage (ft):	10.1354

Working Losses (lb):	8.7858
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Annual Net Throughput (gal/yr.):	300,000.0000
Annual Turnovers:	15.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	20,000.0000
Maximum Liquid Height (ft):	20.0000
Tank Diameter (ft):	13.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	11.0362

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

(P) DT-1 - Vertical Fixed Roof Tank
Freeport, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Hexane (-n)	0.00	0.00	0.00
Benzene	0.02	0.00	0.02
Toluene	0.20	0.05	0.25
Ethylbenzene	0.03	0.01	0.04
Xylene (-m)	0.52	0.13	0.66
1,2,4-Trimethylbenzene	0.43	0.11	0.54
Unidentified Components	7.58	1.94	9.53
Distillate fuel oil no. 2	8.79	2.25	11.04

Texas GulfLink, LLC
Offshore Platform
Surge Tank

Tank Data:

EPN	Description	Tank Type	Stored Product	MW of Crude (lb/lbmol)	Average TVP of Crude (psia)	Annual Operating Hours	Volume (gal)	Annual Throughput (gal/yr)
(P) T-1	Surge Tank	Fixed Roof	Crude oil (RVP 8)	50	6.69	8,760	420,000	84,000

Volume and throughput provided by Abadie-Williams LLC.

Calculation Methodology:
Note: Emissions are based on AP-42, Chapter 7, November 2006.
Average Hourly Rate [lb/hr] = TANKS Emission Report (lb/yr) / 8760 hrs/yr
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = TANKS Emission Report (lb/yr) / 2000 lb/ton

Emission Calculation for One Tank:

Pollutant	VOC Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	5,821.82	0.66	0.66	2.91
2,2,4-Trimethylpentane (isooctane)	0.00	0E+00	0E+00	0E+00
Benzene	34.49	0.004	0.004	0.02
Ethylbenzene	2.31	0.0003	0.0003	0.001
Hexane (-n)	36.96	0.004	0.004	0.02
Isopropyl benzene	0.26	0.00003	0.00003	0.0001
Toluene	16.88	0.002	0.002	0.01
Xylene (-m)	6.77	0.001	0.001	0.003

Hydrogen Sulfide Emissions:

Molecular Weight of H_2S (lb/lbmol): 34.1
Average Concentration of H_2S in Crude (ppmv): 5
Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	5.E-06	5.E-06	2.E-05

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification		
User Identification:	(P) T-1 Fixed	
City:	Galveston	
State:	Texas	
Company:	Sentinel Midstream	
Type of Tank:	Vertical Fixed Roof Tank	
Description:	Surge Tank	
Tank Dimensions		
Shell Height (ft):		65.00
Diameter (ft):		33.00
Liquid Height (ft) :		65.00
Avg. Liquid Height (ft):		32.50
Volume (gallons):		420,000.00
Turnovers:		0.20
Net Throughput(gal/yr):		84,000.00
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	White/White	
Shell Condition	Good	
Roof Color/Shade:	White/White	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)		0.00
Slope (ft/ft) (Cone Roof)		0.06
Breather Vent Settings		
Vacuum Settings (psig):		-0.03
Pressure Settings (psig)		0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 8)	All	71.54	68.18	74.90	69.66	6.6861	6.3175	7.0711	50.0000			207.00	Option 4: RVP=8
1,2,4-Trimethylbenzene						0.0320	0.0282	0.0363	120.1900	0.0033	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5948	1.4590	1.7409	78.1100	0.0060	0.0059	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.6424	1.5056	1.7893	84.1600	0.0070	0.0071	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1604	0.1435	0.1790	106.1700	0.0040	0.0004	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5633	2.3578	2.7832	86.1700	0.0040	0.0063	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane									114.2200	0.0010	0.0000	114.22	
Isopropyl benzene						0.0732	0.0650	0.0824	120.2000	0.0010	0.0000	120.20	Option 2: A=6.93666, B=1460.793, C=207.78
Toluene						0.4684	0.4239	0.5168	92.1300	0.0100	0.0029	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.4027	7.3639	7.3930	49.4978	0.9497	0.9760	220.76	
Xylene (-m)						0.1341	0.1198	0.1498	106.1700	0.0140	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	5,320.3648
Vapor Space Volume (cu ft):	28,091.2134
Vapor Density (lb/cu ft):	0.0586
Vapor Space Expansion Factor:	0.1118
Vented Vapor Saturation Factor:	0.0791
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	28,091.2134
Tank Diameter (ft):	33.0000
Vapor Space Outage (ft):	32.8438
Tank Shell Height (ft):	65.0000
Average Liquid Height (ft):	32.5000
Roof Outage (ft):	0.3438
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.3438
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	16.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0586
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	6.6861
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1118
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.7537
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	6.6861
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	6.3175
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	7.0711
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.0791
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	6.6861
Vapor Space Outage (ft):	32.8438

Working Losses (lb):	501.4549
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	6.6861
Annual Net Throughput (gal/yr.):	84,000.0000
Annual Turnovers:	0.2000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	420,000.0000
Maximum Liquid Height (ft):	65.0000
Tank Diameter (ft):	33.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	5,821.8197

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 8)	501.45	5,320.36	5,821.82
Hexane (-n)	3.18	33.78	36.96
Benzene	2.97	31.52	34.49
Isooctane	0.00	0.00	0.00
Toluene	1.45	15.43	16.88
Ethylbenzene	0.20	2.11	2.31
Xylene (-m)	0.58	6.19	6.77
Isopropyl benzene	0.02	0.24	0.26
1,2,4-Trimethylbenzene	0.03	0.35	0.38
Cyclohexane	3.57	37.87	41.44
Unidentified Components	489.44	5,192.87	5,682.31

Description	Fuel Type	Brake Hp	Annual Operating Hours	Specific Fuel Consumption (Btu/hp-hr)[a]	Heat Input (MMBtu/hr)[b]	Annual Heat Rate (MMBtu/yr)[c]
Firewater Pump	Diesel	350	100	7,000	2.45	245
Firewater Pump	Diesel	350	100	7,000	2.45	245

le for this engine, this calculation uses the average brake-specific fuel consumption from AP-42 Table 3.3-1, Footnote a

000

Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]

urly Rate [lb/hr]

Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Emission Factor[d] [g/kW-hr]	Emission Factor[e] [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Firewater Pump Engine - (P) FWP-1						
0.2	0.15	0.0003	NSPS 4I	0.12	0.12	0.01
0.2	0.15	0.0003	NSPS 4I	0.12	0.12	0.01
-	-	0.002	AP-42, Ch. 3.3	0.72	0.72	0.04
3.5	2.61	0.01	NSPS 4I	2.01	2.01	0.10
4	-	-	NSPS 4I	-	-	-
3.7	2.74	0.01	NSPS 4I	2.12	2.12	0.11
0.3	0.24	0.001	NSPS 4I	0.18	0.18	0.01
Firewater Pump Engine - (P) FWP-2						
0.2	0.15	0.0003	NSPS 4I	0.12	0.12	0.01
0.2	0.15	0.0003	NSPS 4I	0.12	0.12	0.01
-	-	0.002	AP-42, Ch. 3.3	0.72	0.72	0.04
3.5	2.61	0.01	NSPS 4I	2.01	2.01	0.10
4	-	-	NSPS 4I	-	-	-
3.7	2.74	0.01	NSPS 4I	2.12	2.12	0.11
0.3	0.24	0.001	NSPS 4I	0.18	0.18	0.01

n 40 CFR 60, Subpart IIII, Table 4 [225<=kW<450 (300<=Hp<600)]; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NO_x factor used for VOC and NO_x by assuming

atios of NO_x and VOC AP-42 emission factors.

1	73.96
25	3.0E-03
298	6.0E-04
-	-

om 40 CFR 98 Subpart A, Table A-1.

R 98 Subpart C, Tables C-1 and C-2, for diesel.

CO_2			CH_4			N_2O			
(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(met
18	20	399	0.02	0.02	0.4	0.04	0.05	1	
18	20	399	0.02	0.02	0.4	0.04	0.05	1	

art C Equation C-1b.

s per year by 1.10231 short tons/metric ton, as per 40 CFR 98 Subpart A, Table A-2.

Texas GulfLink, LLC
Offshore Platform
Pigging Operations

EPN	Description
(P) P-1	Pigging Operations

The chambers for the inlet gas and residue gas receivers were estimated as shown below.

	Gas Line Receiver	Gas Line Receiver	Gas Line Receiver	TOTAL
Receiver diameter	46 in	28 in	28 in	
Receiver length	20 ft	10 ft	10 ft	
Pipeline Pressure	1 psig	1 psig	1 psig	
Receiver volume	230.82 cu ft	42.76 cu ft	42.76 cu ft	
Gas volume	246.52 SCF	45.67 SCF	45.67 SCF	
Duration of releases	0.50 hr	0.50 hr	0.50 hr	
Releases per year	12 # per yr	12 # per yr	12 # per yr	
VMW of Crude (RVP8) from TANKS 4.09d:	50.00 lb/lbmol	50.00 lb/lbmol	50.00 lb/lbmol	
	385.30 scf/lbmol	385.30 scf/lbmol	385.30 scf/lbmol	
	0.64 lbmol	0.12 lbmol	0.12 lbmol	
	31.99 lbs VOC per event	5.93 lbs VOC per event	5.93 lbs VOC per event	
	383.89 lbs VOC per year	71.12 lbs VOC per year	71.12 lbs VOC per year	
	0.19 tons VOC per year	0.04 tons VOC per year	0.04 tons VOC per year	0.26 tons VOC per year
	0.00227 tons/yr n-Hexane	0.00042 tons/yr n-Hexane	0.00042 tons/yr n-Hexane	0.003 tons/yr n-Hexane
	0.00212 tons/yr Benzene	0.00039 tons/yr Benzene	0.00039 tons/yr Benzene	0.003 tons/yr Benzene
	0.00018 tons/yr Isooctane	0.00003 tons/yr Isooctane	0.00003 tons/yr Isooctane	0.0002 tons/yr Isooctane
	0.00104 tons/yr Toluene	0.00019 tons/yr Toluene	0.00019 tons/yr Toluene	0.001 tons/yr Toluene
	0.00014 tons/yr Ethylbenzene	0.00003 tons/yr Ethylbenzene	0.00003 tons/yr Ethylbenzene	0.0002 tons/yr Ethylbenzene
	0.00042 tons/yr Xylene	0.00008 tons/yr Xylene	0.00008 tons/yr Xylene	0.001 tons/yr Xylene
	0.00002 tons/yr Cumene	0.00000 tons/yr Cumene	0.00000 tons/yr Cumene	0.00002 tons/yr Cumene

From TANKS 4.09d:

NAME	V_WT_FRACT
Hexane (-n)	0.011817236
Benzene	0.011028361
Isooctane	0.000949024
Toluene	0.005398439
Ethylbenzene	0.00073957
Xylene (-m)	0.002163967
Isopropyl benzene	8.44127E-05

Hydrogen Sulfide Emissions:

Molecular Weight of H2S (lb/lbmol): 34.1
Average Concentration of H_2S in Crude (ppmv): 5
Molecular Weight of Crude (lb/lbmol): 50
Average TVP of Crude (psia): 6.69
Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	4.50E-07	4.50E-07	1.97E-06

Texas GulfLink, LLC
Offshore Platform
Platform Fugitive Emissions

EPN	Description
(P) F-1	Platform Fugitive Emissions

Given:

Component Type	Service	Component Count
valves	Light liquid (LL)	50
pump seals	Light liquid (LL)	4
flanges	Light liquid (LL)	100

The number of flanges is assumed to be twice that of valves.

Calculation Methodology:
VOC Average Hourly Rate [lb/hr] = TCEQ Emission Factor [lb/hr/component] x Component Count
VOC TAP Speciate Hourly Rate [lb/hr] = Liquid Mass Fraction x Total VOC Average Hourly Rate [lb/hr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Average Hourly Rate [lb/hr] / Conversion Factor [2000 lb/ton] x Annual Operating Hours

Reference:
Air Permit Technical Guidance for Chemical Sources - Fugitive Guidance, APDG 6422, Air Permits Division TCEQ, June 2018, Table II

Emission Calculation:

Component Type	Light Liquid Emission Factor [lb/hr/component]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
valves	0.0000948	0.005	0.005	0.02
pump seals	0.00119	0.005	0.005	0.02
flanges	0.00001762	0.002	0.002	0.01
	Total VOC	**0.01**	**0.01**	**0.05**

VOC TAP Speciation	Liquid Mass Fraction[(1)]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Benzene	0.006	0.0001	0.0001	0.0003
Ethylbenzene	0.004	0.00005	0.00005	0.0002
n-Hexane	0.004	0.00005	0.00005	0.0002
Toluene	0.010	0.0001	0.0001	0.0005
Xylenes	0.014	0.0002	0.0002	0.001
Cumene (Isopropyl benzene)	0.001	0.00001	0.00001	0.00005
Iso-octane	0.001	0.00001	0.00001	0.00005

Notes:
(1) VOC TAP Speciation Profile from TANKS 4.09d for Crude Oil (RVP 8).

Hydrogen Sulfide Emissions:

Molecular Weight of H2S (lb/lbmol):	34.1
Average Concentration of H_2S in Crude (ppmv):	5
Molecular Weight of Crude (lb/lbmol):	50
Average TVP of Crude (psia):	6.69

Average Concentration of H_2S in Crude is an assumption.

Pollutant	**Average Hourly Rate [lb/hr]**	**Max Hourly Rate [lb/hr]**	**Annual Emission Rate [tpy]**
Hydrogen Sulfide	8.44E-08	8.44E-08	3.70E-07

Texas GulfLink, LLC
Offshore Platform
SPM System Fugitives

EPN	Description
(P) F-2	SPM System Fugitives

Maximum w/ Contingency (days per year) 365 days
24 hr/day

Emission Calculations

Component Type	Total Number of Components [1]	Oil & Gas Emission Factor	Fugitive Emission Factor [2]	Total Organic Compound	Total Organic Compound	Total Organic Compound
		(lb/hr)	(lb/hr/component)	lbs/hr	lbs/day	tons/project
Valves	16	Light Liquid (Light Oil> 20° API)	5.50E-03	8.80E-02	2.11	0.39
Flanges	52	Light Liquid (Light Oil> 20° API)	2.43E-04	1.26E-02	0.30	0.06
	Total TOC [4] - Heavy Oil Streams			**0.10**	**2.42**	**0.44**

[1] Component counts are based on engineering design information provided by Abadie-Williams LLC.
[2] Emission Factors were obtained from *Table 4. Average Emission Factors - Petroleum Industry* (Oil & Gas Production Operations) of TCEQ's Addendum to RG-360A, Emission Factors for Equipment Leak Fugitives Components, January 2008.
[3] Fugitive emissions are conservatively estimated to be 100% VOC.
[4] Annual operating hours are conservatively assumed to be 8,760 hours per year.

Texas GulfLink, LLC
Offshore Platform
Miscellaneous Emissions

EPN	Description
(P) S-1	Sampling Activities
(P) PM-1	Pump Maintenance

Sampling Activities

Emissions from sampling activities are estimated based on the following:

Quantity	Units
1	sample/shift
3	shifts/day
0.1	lb VOC/sample
0.05	ton VOC/yr

Pump Maintenance

Emissions from pump maintenance are estimated based on the following:

Quantity	Units
4	pumps
1	maintenance event/yr
1	lb/maintenance event
0.002	ton VOC/yr

Appendix C
RBLC Search Results

TABLE C1 - RBLC VOC DATA SEARCH FOR REFINING LOADINGS (SECTION 50.004)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
LA-0213	ST. CHARLES REFINERY	CRU: CHLOROSORB VENT AND DUST COLLECTOR	50.003				COMPLY WITH 40 CFR 63 SUBPART UUU	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	FLARE 1-5 (15-77, 12-81, 2004-5A, 2004-5B & 2005-38)	50.008				COMPLY WITH 40 CFR 63 SUBPART A	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	SRU THERMAL OXIDIZERS (99-3, 99-4, 2005-39, 2007-4)	50.006		50	MMBTU/H	PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0.34	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	PETROLEUM PRODUCT LOADING DOCKS (94-9)	50.004				COMPLY WITH LAC 33:III.2108 FOR LOADING MATERIALS WITH VAPOR PRESSURE > 1.5 PSIA	687	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	MVR THERMAL OXIDIZER NO. 1 (94-8)	50.008		240	MMBTU/H	COMPLY WITH LAC 33:III.2108 AND 40 CFR 63 SUBPART CC	442	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	MVR THERMAL OXIDIZER NO. 2 (2008-38)	50.008	REFINERY FUEL GAS	200	MMBTU/H	COMPLY WITH 40 CFR 61 SUBPART BB	5.4	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	LOADINGS - REFINERY	50.004				TRUCK/RAILCAR LOADING: COMPLY WITH 40 CFR 63 SUBPART CC	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	LOADINGS - AROMATIC RECOVERY UNIT	64.005				RAILCAR LOADING: COMPLY WITH 40 CFR 63 SUBPART G MARINE LOADING: COMPLY WITH 40 CFR 61 SUBPART BB	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	THERMAL OXIDIZERS (2008-32, 2008-33, 2008-34)	50.008	PROCESS FUEL GAS	15	MMBTU/H EA	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0		BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 1 or 2 Marine Vapor Recovery Loading (406-D-15, EQT 75)	50.004		630000	GALS/HR	FLARE	0.071	LB/1000 GALS	BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 1 or 2 Marine Vapor Recovery Loading (406-D-16, EQT 76)	50.004		630000	GALS/HR	FLARE	0.071	LB/1000 GALS	BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 1 Non-MVR Loading (406-1, EQT 77)	50.004		630000	GALS/HR		0.206	LB/1000 GALS	BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 3 Non-MVR Loading (406-3, EQT 198)	50.004		630000	GALS/HR		0.206	LB/1000 GALS	BACT-PSD
LA-0284	ALLIANCE REFINERY	Product Dock No. 2 Non-MVR Loading (406-2, EQT 78)	50.004		630000	GALS/HR		0.206	LB/1000 GALS	BACT-PSD
LA-0316	CAMERON LNG FACILITY	thermal oxidizers (4 units)	19.2	natural gas	390.42	mm btu/hr	good equipment design, proper operating practices, and fueled by natural gas	0		BACT-PSD
LA-0316	CAMERON LNG FACILITY	Flares (3 units)	19.39	natural gas	0		proper plant operations and maintaining the presence of the flame at the flare tips when vent gas is routed to the flares	0		BACT-PSD
LA-0316	CAMERON LNG FACILITY	condensate loading	50.004		604240	bbls/yr	good equipment design and proper operating practices; vapor balanced loading	0		BACT-PSD
TX-0812	CRUDE OIL PROCESSING FACILITY	Petroleum Liquid Storage in Floating Roof tanks	42.006		0		Internal floating roof. Integrity of the floating roof seal must be verified through periodic visual inspections and seal gap measurements. The tank must be constructed with a drain dry sump, and an available connection to a control device.	3.04	T/YR	BACT-PSD

TABLE C1 - RBLC VOC DATA SEARCH FOR REFINING LOADINGS (SECTION 50.004)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
TX-0812	CRUDE OIL PROCESSING FACILITY	Petroleum Refining Separation Processes	50.005		35000	BBL/DAY	Continuous flaring of distillation unit overheads must be discontinued following start of operation of the condensate splitter (including gas plant). All process vents or pressure relief devices (including steam ejectors and intermittent process vents) must be directed to a flare meeting 40 CFR Â§60.18 requirements.	0		BACT-PSD
TX-0812	CRUDE OIL PROCESSING FACILITY	Refinery Flares	19.33		0		The flare must conform to 40 CFR Â§ 60.18 requirements. Vent stream composition and flow must be continuously monitored to demonstrate compliance.	0		BACT-PSD
TX-0812	CRUDE OIL PROCESSING FACILITY	Transfer Operations	50.004		80	MM BBL / YR	If the product loaded has a VOC vapor pressure in excess of 0.50 psia, all displaced loading vapors must be captured and directed to a vapor combustor with a destruction/removal efficiency (DRE) of 99.5% or greater. For non-inerted ships (inland barges), capture system integrity is ensured by loading under vacuum. For inerted vessels (oceangoing tankers and barges), the ship must possess a recent vapor tightness certification prior to start of loading.	0		BACT-PSD
OH-0308	SUN COMPANY, INC., TOLEDO REFINERY	FLARE, STEAM ASSISTED	50.008	PROCESS GASES	155.44	MMBTU/H	FLARE IS CONTROL FOR HYDROCARBONS	0.84	LB/H	MACT
OH-0308	SUN COMPANY, INC., TOLEDO REFINERY	PROPYLENE-PROPANE LOADING RACK	50.004	PROPANE/PROPYLENE	34224600	GAL/YR	PRESSURIZED LOADING	1.6	T/YR	N/A

TABLE C2 - RBLC VOC DATA SEARCH FOR VOLATILE ORGANIC LIQUID STORAGE (SECTION 42.009)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
TX-0840	CORPUS CHRISTI TERMINAL	Heavy oil storage	42.005		0		1 fixed roof tank has storage of heavy oil (EPN: T-1334) with VP < 0.5 psia, painted white and equipped with submerged fill pipe.	0		BACT-PSD
TX-0850	CORPUS CHRISTI TERMINAL	Crude and condensate storage in nine IFR	42.009		0		100 series tanks storing crude / condensate (EPNs: S-100-101 through S-100-109). These tanks will be authorized to store crude oil and condensate with a VP > 0.5 psia and with capacities > 25,000 gallons. Each of the tanks is equipped with an internal floating roof and is equipped with either a mechanical shoe or double vapor mounted seal. 6 EFR tanks storing crude / condensate (EPNs: S-200M4, S-200M5, S-200M6, S-200M7, S-200M8 and S-200M9) These tanks will be equipped with welded deck seams since the tank will store products with VOC vapor pressure of 0.5 psia or greater. Proper fitting and seal integrity for the floating roof is ensured through visual inspections and any seal gap measurements specified in 40 CFR Â§ 60.113b.	0		BACT-PSD
LA-0272	AMMONIA PRODUCTION FACILITY	FRONT END PROCESS FLARE (2203-B)	19.31		0		COMPLY WITH THE MINIMUM HEAT CONTENT AND MAXIMUM TIP VELOCITY PROVISIONS OF 40 CFR 63 SUBPART A OR ADHERE TO THE REQUIREMENTS OF 40 CFR 63.11(B)(6)(i); OPERATE FLARE AT ALL TIMES EMISSIONS ARE BEING VENTED TO IT; OPERATE WITH FLAME PRESENT AT ALL TIMES.	0.01	LB/H	BACT-PSD
LA-0272	AMMONIA PRODUCTION FACILITY	BACK END PROCESS FLARE (2204-B)	19.31		0		COMPLY WITH THE MINIMUM HEAT CONTENT AND MAXIMUM TIP VELOCITY PROVISIONS OF 40 CFR 63 SUBPART A OR ADHERE TO THE REQUIREMENTS OF 40 CFR 63.11(B)(6)(i); OPERATE FLARE AT ALL TIMES EMISSIONS ARE BEING VENTED TO IT; OPERATE WITH FLAME PRESENT AT ALL TIMES.	0.01	LB/H	BACT-PSD
OK-0156	NORTHSTAR AGRI IND ENID	Crude Meal Emissions	70.39		2500	Tons per day	Desolventizer/Toaster Operation	157	DEGREES F	BACT-PSD
AR-0124	EL DORADO SAWMILL	ELEVEN OIL STORAGE TANKS SN-14	42.009		0		ENCLOSED TANKS, TANKS ARE LIGHT COLOR	0.3	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	TANKS - FOR HEAVY MATERIALS	42.005				EQUIPPED WITH FIXED ROOF AND COMPLY WITH 40 CFR 63 SUBPART CC	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	TANKS - FOR BENZENE, XYLENE, SULFOLANE, PAREX, INTERMEDIATE	42.009				EQUIPPED WITH INTERNAL FLOATING ROOFS FOLLOWED BY THERMAL OXIDIZERS	0		BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	TURBINE LUBE OIL STORAGE TANKS	42.009		6800	GALLONS EACH	GOOD COMBUSTION PRACTICE AND FUEL SPECIFICATION	0		BACT-PSD
LA-0272	AMMONIA PRODUCTION FACILITY	CO2 STRIPPER VENT (102-E)	62.999		115.83	TONS/HR	GOOD COMBUSTION PRACTICES	21.78	LB/H	BACT-PSD
*LA-0312	ST. JAMES METHANOL PLANT	RV-13 - Reformer Vent (EQT0001)	50.003	Natural Gas	3148	MM BTU/hr	Good Combustion Practices	16.97	LB/HR	BACT-PSD
TX-0663	JACKSON COUNTY GAS PLANT	Heaters	13.31	Natural Gas	17	MMBTU/H	Good combustion practices	0		BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	VEHICLE DIESEL TANK	42.005		650	GALLONS	GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION	0		BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	EMERGENCY GENERATOR ULSD TANK	42.005		300	GALLONS	GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION	0		BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	EMERGENCY GENERATOR ULSD TANKS	42.005		550	GALLONS EACH	GOOD DESIGN AND OPERATING PRACTICES	0		BACT-PSD

TABLE C2 - RBLC VOC DATA SEARCH FOR VOLATILE ORGANIC LIQUID STORAGE (SECTION 42.009)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
IA-0106	CF INDUSTRIES NITROGEN, LLC - PORT NEAL NITROGEN COMPLEX	Flares	61.012	natural gas	0		good operating practices and use of natural gas	0		BACT-PSD
TX-0656	GAS TO GASOLINE PLANT	METHANOL AND WATER STORAGE TANK	42.009		3087	GAL	HORIZONTAL FIXED ROOF WITH SUBMERGED FILL, WHITE EXTERIOR	0.12	T/YR	BACT-PSD
TX-0840	CORPUS CHRISTI TERMINAL	Crude and condensate storage	42.009		30000	BBL/H	IFR TANKS: 9 tanks (EPNs: TK-100-101 through TK-100-109) to store crude oil and condensate with a VP > 0.5 psia and with capacities > 25,000 gallons. Each of the tanks is equipped with an internal floating roof and is equipped with either a mechanical shoe or double vapor mounted seal.	0		BACT-PSD
LA-0276	BATON ROUGE JUNCTION FACILITY	Tank 190 (EQT0036 - IFR)	42.006		0		Internal floating roof and submerged fill pipe	0		BACT-PSD
MS-0092	EMBERCLEAR GTL MS	Storage Tank, MTG Heavy Gasoline	42.009	MTG heavy gasoline	714000	GAL	internal floating roof, white or aluminum surface	0		BACT-PSD
TX-0851	RIO BRAVO PIPELINE FACILITY	Thermal Oxidizer	13.31	NATL GAS	71.3	MMBTU/HR	Natural Gas / Clean Fuel, good combustion practices.	0.0054	LB/MMBTU	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	FRONT END PROCESS FLARE	19.31	NATURAL GAS PILOT	0.25	MMBTU/H	NATURAL GAS FOR PILOT, FLARE MINIMIZATION PRACTICES	0.0054	LB/MMBTU	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	UAN PLANT VENT FLARE	19.31		0.19	MMBTU/H	NATURAL GAS PILOT, FLARE MINIMIZATION PRACTICES	0.0054	LB/MMBTU	BACT-PSD
LA-0213	ST. CHARLES REFINERY	HEATER F-72-703 (7-81)	11.39	REFINERY FUEL GAS	633	MMBTU/H	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	THERMAL OXIDIZERS (2008-32, 2008-33, 2008-34)	50.008	PROCESS FUEL GAS	15	MMBTU/H EA	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	SRU THERMAL OXIDIZERS (99-3, 99-4, 2005-39, 2007-4)	50.006		50	MMBTU/H	PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0.34	LB/H	BACT-PSD
LA-0213	ST. CHARLES REFINERY	HEATERS (94-21 & 94-29)	13.39	REFINERY FUEL GAS			PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES, AND USE OF GASEOUS FUELS	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	CPF HEATER H-39-03 & H-39-02 (94-28 & 94-30)	13.39	REFINERY FUEL GAS			PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES, AND USE OF GASEOUS FUELS	0.0054	LB/MMBTU	BACT-PSD
LA-0213	ST. CHARLES REFINERY	LOADINGS - AROMATIC RECOVERY UNIT	64.005				RAILCAR LOADING: COMPLY WITH 40 CFR 63 SUBPART G MARINE LOADING: COMPLY WITH 40 CFR 61 SUBPART BB	0		BACT-PSD
*LA-0312	ST. JAMES METHANOL PLANT	MPST-14 - Methanol Product Surge Tank (EQT0019)	42.009	Methanol	41000	gallons	Route emissions to Methanol Product Tanks A & B	0		BACT-PSD
*LA-0312	ST. JAMES METHANOL PLANT	SV1-14 - Crude Methanol Tank Scrubber Vent (EQT0020)	99.999	Methanol	50	gallons/min	Route to reformer fuel gas system except during times of eductor downtime	1.84	LB/HR	BACT-PSD
LA-0213	ST. CHARLES REFINERY	PROCESS VENTS - REFINERY (CCEX)	50.999				ROUTE TO THE FUEL GAS SYSTEMS OR FLARES OR COMPLY WITH 40 CFR 63 SUBPART CC	0		BACT-PSD
TX-0850	CORPUS CHRISTI TERMINAL	Heavy oil storage in fixed roof tank	42.005		0		Storage of heavy oil (EPN: T-1334) in a fixed roof tank with VP < 0.5 psia, painted white and equipped with submerged fill pipe.	0		BACT-PSD
LA-0276	BATON ROUGE JUNCTION FACILITY	Vertical Fixed Roof Tanks 174, 175, 176	42.005		0		Submerged fill pipes and pressure/vacuum vents	0		BACT-PSD
AR-0124	EL DORADO SAWMILL	THREE DIESEL STORAGE TANKS SN-15	42.009		0		TANKS ARE LIGHT COLOR	0.4	LB/H	BACT-PSD

TABLE C2 - RBLC VOC DATA SEARCH FOR VOLATILE ORGANIC LIQUID STORAGE (SECTION 42.009)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE_BASIS
TX-0851	RIO BRAVO PIPELINE FACILITY	Natural Gas Liquid Condensate Tanks and Condensate Loading	42.009		0		THERMAL OXIDIZER	0		BACT-PSD
TX-0851	RIO BRAVO PIPELINE FACILITY	Liquefied Natural Gas Storage Tanks	42.009		0		THERMAL OXIDIZER	0		BACT-PSD
TX-0851	RIO BRAVO PIPELINE FACILITY	LNG Export Acid Gas Removal Unit	50.006		0		THERMAL OXIDIZER	0		BACT-PSD
LA-0213	ST. CHARLES REFINERY	LOADINGS - REFINERY	50.004				TRUCK/RAILCAR LOADING: COMPLY WITH 40 CFR 63 SUBPART CC	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Boom Flare	19.39	Natural Gas	0		Use of good combustion practices and proper flare maintenance	0		BACT-PSD
FL-0328	ENI - HOLY CROSS DRILLING PROJECT	Emergency Engine	17.11	Diesel	0		Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine	0.03	TONS PER YEAR	BACT-PSD
FL-0328	ENI - HOLY CROSS DRILLING PROJECT	Emergency Fire Pump Engine	17.11	Diesel	0		Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine	0.002	TONS PER YEAR	BACT-PSD
FL-0328	ENI - HOLY CROSS DRILLING PROJECT	Storage Tanks	42.009	Diesel	0		Use of good maintenance practices based on the current manufacturerâ€™s specifications for each tank	0.27	TONS PER YEAR	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Storage Tanks	42.009	Diesel	0		Use of good maintenance practices to minimize fugitive emissions, including minimizing the release of emissions from valves, pump seals, and connectors.	0.71	TONS	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Condensate Tank	42.009		0		Use of good maintenance practices to minimize fugitive emissions, including minimizing the release of emissions from valves, pump seals, and connectors.	9.26	TONS	BACT-PSD
TX-0840	CORPUS CHRISTI TERMINAL	TANK MSS	42.006		0		VCU	0		BACT-PSD
MS-0092	EMBERCLEAR GTL MS	Storage Tank, crude methanol storage	42.009	crude methanol	1470000	GAL	Water scrubber	0		BACT-PSD
TX-0656	GAS TO GASOLINE PLANT	Fixed Roof Tanks (3)	42.005		800000	GAL/YR	WATER SCRUBBER	1.65	T/YR	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	ONE (1) DIESEL EXHAUST FLUID (DEF) TANK	42.009		100	TONS UAN	WHITE TANK SHELL, SUBMERGED FILL	0		BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	THREE (3) UAN DAY TANKS	42.009		750	TONS UAN, EACH	WHITE TANK SHELLS, SUBMERGED FILL	0		BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	TWO (2) UAN STORAGE TANKS	42.009		30000	TONS UAN, EACH	WHITE TANK SHELLS, USE SUBMERGED FILL.	0		BACT-PSD
TX-0663	JACKSON COUNTY GAS PLANT	Produced Water Tanks	42.009		0		White, submerged fill	0		BACT-PSD
TX-0663	JACKSON COUNTY GAS PLANT	Fixed Roof Tanks	42.009		0		White, submerged fill	0		BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
*OH-0374	GUERNSEY POWER STATION LLC	Emergency Generators (2 identical, P004 and P005)	17.11	Diesel fuel	2206	HP	Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual.	23.21	LB/H	BACT-PSD
*OH-0378	PTTGCA PETROCHEMICAL COMPLEX	Firewater Pumps (P005 and P006)	17.21	Diesel fuel	402	HP	Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII and employ good combustion practices per the manufacturerâ€™s operating manual	2.64	LB/H	BACT-PSD
*OH-0378	PTTGCA PETROCHEMICAL COMPLEX	Emergency Diesel-fired Generator Engine (P007)	17.11	Diesel fuel	3353	HP	certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual	37.41	LB/H	BACT-PSD
*OH-0378	PTTGCA PETROCHEMICAL COMPLEX	1,000 kW Emergency Generators (P008 - P010)	17.11	Diesel fuel	1341	HP	certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual	14.96	LB/H	BACT-PSD
*OH-0374	GUERNSEY POWER STATION LLC	Emergency Fire Pump (P006)	17.21	Diesel fuel	410	HP	Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual	2.7	LB/H	BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	TWO (2) FIREWATER PUMP DIESEL ENGINES	17.21	DIESEL	371	BHP, EACH	COMBUSTION DESIGN CONTROLS AND USAGE LIMITS	3	G/HP-H	BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	TWO (2) EMERGENCY DIESEL GENERATORS	17.11	DIESEL	1006	HP EACH	COMBUSTION DESIGN CONTROLS AND USAGE LIMITS	4.8	G/HP-H	BACT-PSD
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	EMERGENCY DIESEL GENERATOR	17.11	DIESEL	2012	HP	COMBUSTION DESIGN CONTROLS AND USAGE LIMITS	4.8	G/HP-H	BACT-PSD
NY-0103	CRICKET VALLEY ENERGY CENTER	Emergency fire pump	17.21	ultra low sulfur diesel	460	hp	Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations.	2.6	G/BHP-H	LAER
LA-0301	LAKE CHARLES CHEMICAL COMPLEX ETHYLENE 2 UNIT	Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999)	17.21	Diesel	500	HP	Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage	3.21	LB/HR	BACT-PSD
LA-0313	ST. CHARLES POWER STATION	SCPS Emergency Diesel Generator 1	17.11	Diesel	2584	HP	Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel).	27.34	LB/H	BACT-PSD
LA-0313	ST. CHARLES POWER STATION	SCPS Emergency Diesel Firewater Pump 1	17.21	Diesel	282	HP	Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel).	1.87	LB/H	BACT-PSD
*OH-0376	IRONUNITS LLC - TOLEDO HBI	Emergency diesel-fueled fire pump (P006)	17.21	Diesel fuel	250	HP	Comply with NSPS 40 CFR 60 Subpart IIII	1.6	LB/H	BACT-PSD
*OH-0376	IRONUNITS LLC - TOLEDO HBI	Emergency diesel-fired generator (P007)	17.11	Diesel fuel	2682	HP	Comply with NSPS 40 CFR 60 Subpart IIII	28.2	LB/H	BACT-PSD
LA-0309	BENTELER STEEL TUBE FACILITY	Firewater Pump Engines	17.21	Diesel	288	hp (each)	Complying with 40 CFR 60 Subpart IIII	3	G/BHP-HR	BACT-PSD
LA-0309	BENTELER STEEL TUBE FACILITY	Emergency Generator Engines	17.11	Diesel	2922	hp (each)	Complying with 40 CFR 60 Subpart IIII	6.4	G/KW-HR	BACT-PSD
LA-0316	CAMERON LNG FACILITY	emergency generator engines (6 units)	17.11	diesel	3353	hp	Complying with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0314	INDORAMA LAKE CHARLES FACILITY	Diesel Firewater pump engines (6 units)	17.21	diesel	425	hp	complying with 40 CFR 63 subpart ZZZZ	0		BACT-PSD
LA-0314	INDORAMA LAKE CHARLES FACILITY	Diesel emergency generator engine - EGEN	17.21	diesel	350	hp	complying with 40 CFR 63 subpart ZZZZ	0		BACT-PSD
OH-0363	NTE OHIO, LLC	Emergency generator (P002)	17.11	Diesel fuel	1100	KW	Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII	29.01	LB/H	BACT-PSD
OH-0363	NTE OHIO, LLC	Emergency Fire Pump Engine (P003)	17.21	Diesel fuel	260	HP	Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII	1.72	LB/H	BACT-PSD
SC-0113	PYRAMAX CERAMICS, LLC	EMERGENCY GENERATORS 1 THRU 8	17.11	DIESEL	757	HP	ENGINES MUST BE CERTIFIED TO COMPLY WITH NSPS, SUBPART IIII.	4	GR/KW-H	BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
WY-0070	CHEYENNE PRAIRIE GENERATING STATION	Diesel Emergency Generator (EP15)	17.11	Ultra Low Sulfur Diesel	839	hp	EPA Tier 2 rated	0		BACT-PSD
WY-0070	CHEYENNE PRAIRIE GENERATING STATION	Diesel Fire Pump Engine (EP16)	17.21	Ultra Low Sulfur Diesel	327	hp	EPA Tier 3 rated	0		BACT-PSD
WY-0071	SINCLAIR REFINERY	Emergency Air Compressor	17.21	Ultra Low Sulfur Diesel	400	hp	EPA Tier 3 Rated Diesel Engine	0		BACT-PSD
CA-1192	AVENAL ENERGY PROJECT	EMERGENCY FIREWATER PUMP ENGINE	17.21	DIESEL	288	HP	EQUIPPED W/ A TURBOCHARGER AND AN INTERCOOLER/AFTERCOOLER	3.4	G/HP-H	BACT-PSD
MD-0041	CPV ST. CHARLES	EMERGENCY GENERATOR	17.21	ULTRA-LOW SULFUR DIESEL	1500	KW	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION	4.8	G/HP-H	LAER
MD-0041	CPV ST. CHARLES	EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP	17.21	ULTRA-LOW SULFUR DIESEL	300	HP	EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION	3	G/HP-H	LAER
MD-0046	KEYS ENERGY CENTER	DIESEL-FIRED FIRE PUMP ENGINE	17.21	ULTRA-LOW SULFUR DIESEL	300	HP	EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES	4	G/KW-H	BACT-PSD
MD-0045	MATTAWOMAN ENERGY CENTER	EMERGENCY GENERATOR	17.21	ULTRA-LOW SULFUR DIESEL	1490	HP	EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	6.4	G/KW-H	BACT-PSD
MD-0046	KEYS ENERGY CENTER	DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES (TWO)	17.21	ULTRA-LOW SULFUR DIESEL	1500	KW	EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	6.4	G/KW-H	BACT-PSD
MD-0045	MATTAWOMAN ENERGY CENTER	EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP	17.21	ULTRA-LOW SULFUR DIESEL	305	HP	EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	4	G/KW-H	LAER
NY-0103	CRICKET VALLEY ENERGY CENTER	Black start generator	17.11	ultra low sulfur diesel	3000	KW	Generator equipped with selective catalytic reduction. Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations.	2.11	G/BHP-H	LAER
LA-0308	MORGAN CITY POWER PLANT	2000 KW Diesel Fired Emergency Generator Engine	17.11	Diesel	20.4	MMBTU/hr	Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII	33.07	LB/H	BACT-PSD
LA-0308	MORGAN CITY POWER PLANT	380 HP Diesel Fired Pump Engine	17.21	Diesel	2.3	MMBTU/hr	Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII	2.92	LB/H	BACT-PSD
*OH-0368	PALLAS NITROGEN LLC	Emergency Fire Pump Diesel Engine (P008)	17.21	Diesel fuel	460	HP	good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII	0.3	LB/H	BACT-PSD
*OH-0368	PALLAS NITROGEN LLC	Emergency Generator (P009)	17.11	Diesel fuel	5000	HP	good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII	5.5	LB/H	BACT-PSD
*AK-0084	DONLIN GOLD PROJECT	Black Start and Emergency Internal Cumbustion Engines	17.11	Diesel	1500	kWe	Good Combustion Practices	8	G/KW-HR	BACT-PSD
*AK-0084	DONLIN GOLD PROJECT	Fire Pump Diesel Internal Combustion Engines	17.21	Diesel	252	hp	Good Combustion Practices	3.7	G/KW-HR	BACT-PSD
MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	Emergency Engine --Diesel Fire Pump (EUFPENGINE)	17.21	Diesel	165	HP	Good combustion practices	3	G/HP-H	BACT-PSD
IA-0105	IOWA FERTILIZER COMPANY	Emergency Generator	17.11	diesel fuel	142	GAL/H	good combustion practices	6	G/KW-H	BACT-PSD
IA-0105	IOWA FERTILIZER COMPANY	Fire Pump	17.21	diesel fuel	14	GAL/H	good combustion practices	3.75	G/KW-H	BACT-PSD
IN-0173	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	17.21	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	2.83	G/BHP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	17.21	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	2.83	G/B-HP-H	BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
IN-0234	GRAIN PROCESSING CORPORATION	EMERGENCY FIRE PUMP ENGINE	17.21	DISTILLATE OIL	0		GOOD COMBUSTION PRACTICES	9.5	G/HP-H	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	DIESEL-FIRED EMERGENCY GENERATOR	17.11	NO. 2 FUEL OIL	4690	B-HP	GOOD COMBUSTION PRACTICES	4.46	G/B-HP-H	BACT-PSD
IN-0179	OHIO VALLEY RESOURCES, LLC	DIESEL-FIRED EMERGENCY WATER PUMP	17.21	NO. 2 FUEL OIL	481	BHP	GOOD COMBUSTION PRACTICES	2.86	G/B-HP-H	BACT-PSD
IN-0173	MIDWEST FERTILIZER CORPORATION	DIESEL FIRED EMERGENCY GENERATOR	17.11	NO. 2, DIESEL	3600	BHP	GOOD COMBUSTION PRACTICES	4.46	G/BHP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	DIESEL FIRED EMERGENCY GENERATOR	17.11	NO. 2, DIESEL	3600	BHP	GOOD COMBUSTION PRACTICES	4.46	G/B-HP-H	BACT-PSD
*OH-0377	HARRISON POWER	Emergency Diesel Generator (P003)	17.11	Diesel fuel	1860	HP	Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII	19.68	LB/H	BACT-PSD
*OH-0377	HARRISON POWER	Emergency Fire Pump (P004)	17.21	Diesel fuel	320	HP	Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII	2.12	LB/H	BACT-PSD
MD-0044	COVE POINT LNG TERMINAL	EMERGENCY GENERATOR	17.11	ULTRA LOW SULFUR DIESEL	1550	HP	GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMIT	4.8	G/HP-H	LAER
MD-0044	COVE POINT LNG TERMINAL	5 EMERGENCY FIRE WATER PUMP ENGINES	17.21	ULTRA LOW SULFUR DIESEL	350	HP	GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMIT	3	G/HP-H	LAER
LA-0204	PLAQUEMINE PVC PLANT	SMALL EMERGENCY ENGINES	17.21	DIESEL			GOOD COMBUSTION PRACTICES AND GASEOUS FUEL BURNING	4.41	LB/MMBTU	BACT-PSD
LA-0204	PLAQUEMINE PVC PLANT	LARGE EMERGENCY ENGINES	17.11	DIESEL			GOOD COMBUSTION PRACTICES AND GASEOUS FUEL BURNING	3.2	LB/MMBTU	BACT-PSD
MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	EUEMENGINE (South Plant): Emergency Engine	17.11	Diesel	1341	HP	Good combustion practices and meeting NSPS IIII requirements.	6.4	G/KW-H	BACT-PSD
MI-0423	INDECK NILES, LLC	EUEMENGINE (Diesel fuel emergency engine)	17.11	Diesel Fuel	22.68	MMBTU/H	Good combustion practices and meeting NSPS IIII requirements.	6.4	G/KW-H	BACT-PSD
MI-0423	INDECK NILES, LLC	EUFPENGINE (Emergency engine--diesel fire pump)	17.21	Diesel	1.66	MMBTU/H	Good combustion practices and meeting NSPS Subpart IIII requirements.	3	G/BHP-H	BACT-PSD
MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	EUFPENGINE (South Plant): Fire pump engine	17.21	Diesel	300	HP	Good combustion practices and meeting NSPS Subpart IIII requirements.	3	G/BHP-H	BACT-PSD
MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	EUEMENGINE (North Plant): Emergency Engine	17.11	Diesel	1341	HP	Good combustion practices and meeting NSPS Subpart IIII requirements.	6.4	G/KW-H	BACT-PSD
MI-0433	MEC NORTH, LLC AND MEC SOUTH LLC	EUFPENGINE (North Plant): Fire pump engine	17.21	Diesel	300	HP	Good combustion practices and meeting NSPS Subpart IIII requirements.	3	G/BHP-H	BACT-PSD
LA-0328	PLAQUEMINES PLANT 1	Emergency Diesel Engine Pump P-39A	17.21	Diesel Fuel	375	HP	Good combustion practices and NSPS IIII	4	G/KW-H	BACT-PSD
LA-0328	PLAQUEMINES PLANT 1	Emergency Diesel Engine Pump P-39B	17.21	Diesel Fuel	300	HP	Good combustion practices and NSPS Subpart IIII	4	G/KW-H	BACT-PSD
*VA-0328	C4GT, LLC	Emergency Diesel GEN	17.11	Ultra Low Sulfur Diesel	500	H/YR	good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw.	4.8	G/HP H	BACT-PSD
*VA-0328	C4GT, LLC	Emergency Fire Water Pump	17.21	Ultra Low Sulfur Diesel	500	HR/YR	Good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw.	3	G/HP-HR	BACT-PSD
MD-0043	PERRYMAN GENERATING STATION	EMERGENCY GENERATOR	17.11	ULTRA LOW SULFUR DIESEL	1300	HP	GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD	4.8	G/HP-H	LAER
MD-0043	PERRYMAN GENERATING STATION	EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP	17.21	ULTRAL LOW SULFUR DIESEL	350	HP	GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD	3	G/HP-H	LAER

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
WI-0263	WISCONSIN POWER & LIGHT - NEENAH GENERATING STATION	Fire pump (process P05)	17.21	Diesel	1.27	mmBtu/hr	Good combustion practices, use diesel fuel, and operate <500 hr/yr	0		BACT-PSD
MI-0424	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	EUFPENGINE (Emergency engine--diesel fire pump)	17.21	diesel	500	H/YR	Good combustion practices.	3	G/HP-H	BACT-PSD
MI-0434	FLAT ROCK ASSEMBLY PLANT	EUENGINE01 through EUENGINE08	17.11	Diesel	3633	BHP	Good combustion practices.	6.4	G/KW-H	BACT-PSD
MI-0434	FLAT ROCK ASSEMBLY PLANT	EUFIREPUMPENGS (2 emergency fire pump engines)	17.21	Diesel	250	BHP	Good combustion practices.	3	G/B-HP-H	BACT-PSD
MI-0434	FLAT ROCK ASSEMBLY PLANT	EULIFESAFETYENG - One diesel-fueled emergency engine/generator	17.21	Diesel	500	KW	Good combustion practices.	4	G/KW-H	BACT-PSD
MI-0399	DETROIT EDISON--MONROE	4 Diesel-fired quench pumps	17.21	Diesel fuel	252	HP	Good combustion practices.	7.8	G/HP-H	BACT-PSD
*MD-0042	WILDCAT POINT GENERATION FACILITY	EMERGENCY GENERATOR 1	17.11	ULTRA LOW SULFU DIESEL	2250	KW	LIMITED OPERATING HOURS, USE OF ULTRA- LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	4.8	G/HP-H	LAER
*MD-0042	WILDCAT POINT GENERATION FACILITY	EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP	17.21	ULTRA LOW SULFUR DIESEL	477	HP	LIMITED OPERATING HOURS, USE OF ULTRA- LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES	3	G/HP-H	LAER
AK-0083	KENAI NITROGEN OPERATIONS	Diesel Fired Well Pump	17.21	Diesel	2.7	MMBTU/H	Limited Operation of 168 hr/yr.	4.41	LB/MMBTU	BACT-PSD
FL-0354	LAUDERDALE PLANT	Emergency fire pump engine, 300 HP	17.21	Diesel	29	MMBTU/H	Low-emitting fuel and certified engine	4	G / KWH	BACT-PSD
TX-0846	MOTOR VEHICLE ASSEMBLY PLANT	FIRE PUMP DIESEL ENGINE	17.21	NO 2 DIESEL	214	kW	Meets EPA Tier 4 requirements	0.4	G/KW	BACT-PSD
*FL-0367	SHADY HILLS COMBINED CYCLE FACILITY	1,500 kW Emergency Diesel Generator	17.11	ULSD	14.82	MMBtu/hour	Operate and maintain the engine according to the manufacturer's written instructions	6.4	G/KW-HOUR	BACT-PSD
*FL-0367	SHADY HILLS COMBINED CYCLE FACILITY	Emergency Fire Pump Engine (347 HP)	17.21	ULSD	8700	gal/year	Operate and maintain the engine according to the manufacturer's written instructions	4	G/KW-HR	BACT-PSD
CA-1191	VICTORVILLE 2 HYBRID POWER PROJECT	EMERGENCY ENGINE	17.11	DIESEL	2000	KW	OPERATIONAL RESTRICTION OF 50 HR/YR	6	G/KW-H	BACT-PSD
CA-1191	VICTORVILLE 2 HYBRID POWER PROJECT	EMERGENCY FIREWATER PUMP ENGINE	17.21	DIESEL	135	KW	OPERATIONAL RESTRICTION OF 50 HR/YR, OPERATE AS REQUIRED FOR FIRE SAFETY TESTING	3.8	G/KW-H	BACT-PSD
MI-0410	THETFORD GENERATING STATION	EU-FPENGINE: Diesel fuel fired emergency backup fire pump	17.21	diesel fuel	315	hp nameplate	Proper combustion design and ultra low sulfur diesel fuel.	3	G/HP-H	BACT-PSD
LA-0323	MONSANTO LULING PLANT	Fire Water Diesel Pump No. 4 Engine	17.11	Diesel Fuel	600	hp	Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0323	MONSANTO LULING PLANT	Standby Generator No. 9 Engine	17.21	Diesel Fuel	400	hp	Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0323	MONSANTO LULING PLANT	Fire Water Diesel Pump No. 3 Engine	17.11	Diesel Fuel	600	hp	Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
SC-0113	PYRAMAX CERAMICS, LLC	FIRE PUMP	17.21	DIESEL	500	HP	PURCHASE OF CERTIFIED ENGINE BASED ON NSPS, SUBPART IIII.	4	GR/KW-H	BACT-PSD
SC-0113	PYRAMAX CERAMICS, LLC	EMERGENCY ENGINE 1 THRU 8	17.21	DIESEL	29	HP	PURCHASE OF CERTIFIED ENGINE.	7.5	GR/KW-H	BACT-PSD
OH-0352	OREGON CLEAN ENERGY CENTER	Emergency fire pump engine	17.21	diesel	300	HP	Purchased certified to the standards in NSPS Subpart IIII	1.7	LB/H	BACT-PSD
OH-0352	OREGON CLEAN ENERGY CENTER	Emergency generator	17.11	diesel	2250	KW	Purchased certified to the standards in NSPS Subpart IIII	27.8	LB/H	BACT-PSD
OH-0360	CARROLL COUNTY ENERGY	Emergency generator (P003)	17.11	diesel	1112	KW	Purchased certified to the standards in NSPS Subpart IIII	13.74	LB/H	BACT-PSD
OH-0360	CARROLL COUNTY ENERGY	Emergency fire pump engine (P004)	17.21	diesel	400	HP	Purchased certified to the standards in NSPS Subpart IIII	2.3	LB/H	BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
MI-0435	BELLE RIVER COMBINED CYCLE POWER PLANT	EUEMENGINE: Emergency engine	17.11	Diesel	2	MW	State of the art combustion design.	6.4	G/KW-H	BACT-PSD
MI-0435	BELLE RIVER COMBINED CYCLE POWER PLANT	EUFPENGINE: Fire pump engine	17.21	Diesel	399	BHP	State of the art combustion design.	4	G/KW-H	BACT-PSD
*OH-0366	CLEAN ENERGY FUTURE - LORDSTOWN, LLC	Emergency fire pump engine (P004)	17.21	Diesel fuel	140	HP	State-of-the-art combustion design	0.81	LB/H	BACT-PSD
*OH-0366	CLEAN ENERGY FUTURE - LORDSTOWN, LLC	Emergency generator (P003)	17.11	Diesel fuel	2346	HP	State-of-the-art combustion design	21.6	LB/H	BACT-PSD
*OH-0367	SOUTH FIELD ENERGY LLC	Emergency fire pump engine (P004)	17.21	Diesel fuel	311	HP	State-of-the-art combustion design	1.79	LB/H	BACT-PSD
*OH-0367	SOUTH FIELD ENERGY LLC	Emergency generator (P003)	17.11	Diesel fuel	2947	HP	State-of-the-art combustion design	27.18	LB/H	BACT-PSD
*OH-0370	TRUMBULL ENERGY CENTER	Emergency generator (P003)	17.11	Diesel fuel	1529	HP	State-of-the-art combustion design	16.07	LB/H	BACT-PSD
*OH-0370	TRUMBULL ENERGY CENTER	Emergency fire pump engine (P004)	17.21	Diesel fuel	300	HP	State-of-the-art combustion design	1.97	LB/H	BACT-PSD
*OH-0372	OREGON ENERGY CENTER	Emergency generator (P003)	17.11	Diesel fuel	1529	HP	State-of-the-art combustion design	16.1	LB/H	BACT-PSD
*OH-0372	OREGON ENERGY CENTER	Emergency fire pump engine (P004)	17.21	Diesel fuel	300	HP	State-of-the-art combustion design	1.97	LB/H	BACT-PSD
ID-0018	LANGLEY GULCH POWER PLANT	EMERGENCY GENERATOR ENGINE	17.11	DIESEL	750	KW	TIER 2 ENGINE-BASED, GOOD COMBUSTION PRACTICES (GCP)	6.4	G/KW-H	BACT-PSD
ID-0018	LANGLEY GULCH POWER PLANT	FIRE PUMP ENGINE	17.21	DIESEL	235	KW	TIER 3 ENGINE-BASED GOOD COMBUSTION PRACTICES (GCP)	4	G/KW-H	BACT-PSD
*OH-0379	PETMIN USA INCORPORATED	Black Start Generator (P007)	17.21	Diesel fuel	158	HP	Tier IV engine Tier IV NSPS standards certified by engine manufacturer.	0.104	LB/H	BACT-PSD
*OH-0379	PETMIN USA INCORPORATED	Emergency Generators (P005 and P006)	17.11	Diesel fuel	3131	HP	Tier IV engine Tier IV NSPS standards certified by engine manufacturer.	3.45	LB/H	BACT-PSD
IL-0114	CRONUS CHEMICALS, LLC	Emergency Generator	17.11	distillate fuel oil	3755	HP	Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7.	0.67	G/KW-H	BACT-PSD
IL-0114	CRONUS CHEMICALS, LLC	Firewater Pump Engine	17.21	distillate fuel oil	373	hp	Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7.	3.5	G/KW-H	BACT-PSD
FL-0348	MURPHY EXPLORATION & PRODUCTION CO.	Drill Floor and Crew Quarters Electrical Generators	17.11	Diesel	6789	hp	Use of engine with turbo charger with after cooler, an enhanced work practice power management, NOx emissions maintenance system, and good combustion and maintenance practices based on the current manufacturerâ€™s specifications for each engine.	26	G/KW-H	BACT-PSD
FL-0348	MURPHY EXPLORATION & PRODUCTION CO.	Emergency Electrical Generator	17.11	Diesel	1100	hp	Use of good combustion and maintenance practices based on the current manufacturerâ€™s specifications for this engine.	0.22	TONS	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Fast Rescue Craft Diesel Engine - C.R. Luigs	17.11	diesel	142	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel	0		BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Life Boat Diesel Engines - C.R. Luigs	17.21	diesel	39	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel	0		BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Fast Rescue Craft Diesel Engine - Development Driller 1	17.21	Diesel	142	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger	0		BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Seismic Operations Diesel Engines - Development Driller 1	17.21	Diesel	415	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger	3.54	TONS	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs	17.21	diesel	305	HP	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler	82.83	T/12MO ROLLING TOTAL	BACT-PSD

TABLE C3A - RBLC NOx DATA SEARCH FOR DIESEL ICE ENGINES LESS THAN 500 BHP (SECTION 17.210)

RBLCID	FACILITY NAME	PROCESS NAME	PROCCESS TYPE	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL_METHOD_DESCRIPTION	EMISSION	UNIT	CASE-BY-CASE_BASIS
FL-0338	SAKE PROSPECT DRILLING PROJECT	Emergency Generator Diesel Engine - C.R. Luigs	17.11	diesel	2064	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler	1.49	T/12MO ROLLING TOTAL	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs	17.21	diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler	8.69	T/12MO ROLLING TOTAL	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Diesel Powered Forklift Engine	17.21	Diesel	30	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Well Evaluation Diesel Engine	17.21	Diesel	140	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Escape Capsule Diesel Engine	17.21	Diesel	39	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Wireline Diesel Engines	17.21	Diesel	0		Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Water Blasting Diesel Engine	17.21	Diesel	208	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Fast Rescue Craft Diesel Engine	17.21	Diesel	230	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Main Propulsion Generator Diesel Engines	17.11	Diesel	9910	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	12.7	G/KW-H	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Emergency Diesel Engine	17.11	Diesel	3300	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Remotely Operated Vehicle Emergency Generator	17.21	Diesel	427	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Flowback Boiler	13.22	Diesel	8	MMBTU/H	Use of good combustion practices based on the most recent manufacturer's specifications issued for this boiler	0		BACT-PSD
FL-0324	PALM BEACH RENEWABLE ENERGY PARK	250 Kw Emergency Generator	17.21	ULSD	0		Use of inherently clean ultra low sulfur distillate (ULSD) fuel oil and GCP	4	G/KW-H	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Caterpillar C18DITA Diesel Engine Generator	17.11	No. 2 Distillate Fuel Oil	900	BHP	utilize efficient combustion/design technology	14	LB/HR	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump	17.21	No. 2 Fuel Oil	182	BHP	utilize efficient combustion/design technology	2	LB/HR	BACT-PSD

Appendix D
BACT Cost Analysis Sheets

Table D1a – Estimated CO Catalyst System Capital Costs for TGL Generators (4 MMBtu/hr)

CAPITAL COST ESTIMATION FACTORS FOR CO system		
ITEM	BASIS	Calculated Value
DIRECT COSTS		
Purchased Equipment Cost		
Equipment Cost + Auxiliaires	Vendor Estimate Cost	50,871
Instrumentation	0.10 * A	5,087
Sales Tax	0.065 * A	3,307
Freight	0.05 *A	2,544
Total Purchased Equipment Cost (PEC)	B=1.215 * A	**61,809**
Direct Installation Costs		
Foundations and Supports	0.08 * B	4,945
Handling and Erection	0.14 * B	8,653
Electrical	0.04 * B	2,472
Piping	0.02 * B	1,236
Insultation for Ductwork	0.01 * B	618
Painting	0.01 * B	618
Total Direct Installation Cost	C=1.30 * B	**80,351**
Site Preparation, (SP)	As Required	2,000
Buildings, (Bldg)	As Required	2,000
Total Direct Cost, DC	C + SP + Bldg	**84,351**
INDIRECT COSTS		
Engineering	0.10 * B	6,181
Construction and Field Expenses	0.05 * B	3,090
Contractor Fees	0.10 * B	6,181
Start-Up	0.02 * B	1,236
Performance Test	0.01 * B	618
Contingencies	Variable = 35%	21,633
Total Indirect Cost, IC	0.28 * B + Contin. + IDC	**38,939**
Total Capital Investment (TCI)	**DC + IC**	**123,291**

Table D1b – Annual CO Catalyst System Operating Costs for TGL Generators (4 MMBtu/hr)

ANNUALIZED COST FACTORS FOR CO SYSTEM			
ITEM	**COST FACTOR**	**UNIT COST**	**COST, $**
DIRECT ANNUAL COSTS (DC)			
Operating Labor			
Operator	0.5 hr/shift	$50/hr	27,375
Supervisor	15% Operating Labor	NA	4,106
Maintenance			
CO Catalyst Labor Requirement	0.5 hour per day	$60/hr	10,950
Catalyst Replacement Labor	8 workers - 80 hrs every 5 yrs	$60/hr	7,680
Material	100% maintenance labor	NA	18,630
Supervisor	15% labor	NA	2,795
Catalyst	100% replaced/5 years		9,147
INDIRECT ANNUAL COSTS (IC)			
Overhead	60% * (labor + materials)	60% of O&M costs	48,410
Administrative Charges	2% TCI	2% of Total Capital Invest.	2,466
Property Taxes	1% TCI	1% of Total Capital Invest.	1,233
Insurance	1% TCI	1% of Total Capital Invest.	1,233
Capital Recovery	CRF * TCI	20 yr life; 7% Int.	11,639
Total Annual Cost (TAC) ($)	Sum of Annual Costs		**145,663**
Tons VOC removed	@ 15% O2 (60% Reduction)		0.7
Cost per ton of VOC ($/ton)			**211,106**

1) Labor Assumption of 3 shifts/day for 365 days/yr

2) CRF =0.0944 assuming 7% interest over 20 years

Table D2a – Estimated SCR System Capital Costs for TGL Generators Operated 8,760 hrs/yr

ITEM		BASIS	Calculated Value
DIRECT COSTS			
Purchased Equipment Cost			
Equipment Cost + Auxiliaires		[A]	**138,483**
Instrumentation		0.10 * A	13,848
Sales Tax		0.065 * A	9,001
Freight		0.05 *A	6,924
Total Purchased Equipment Cost (PEC)		B=1.215 * A	**168,257**
Direct Installation Costs			
Foundations and Supports		0.08 * B	13,461
Handling and Erection		0.14 * B	23,556
Electrical		0.05 * B	8,413
Piping		0.02 * B	3,365
Insultation for Ductwork		0.01 * B	1,683
Painting		0.01 * B	1,683
Total Direct Installation Cost		C=1.31 * B	220,416
Site Preparation, (SP)		As Required	10,000
Buildings, (Bldg)		As Required	10,000
Total Direct Cost, DC			**240,416**
INDIRECT COSTS			
Engineering		0.10 * B	16,826
Construction and Field Expenses		0.05 * B	8,413
Contractor Fees		0.10 * B	16,826
Start-Up		0.02 * B	3,365
Performance Test		Manufacturer	10,000
Total Indirect Costs, IDC			**55,429**
Project Contingency		35%	103,546
Inventory Capital		1000 gal 32.5% Aqueous Ammonia	29,063
Simple Interest During Construction, (IDC)		DC * i * n	24,042
i = interest rate (5%), n = interest periods (2 yrs)			
Total Capital Investment (TCI)			**452,496**

[A] Estimated SCR with Silencer Equipment costs based on two vendors (Maxim and Miratech)

Table D2b – Annual SCR System Operating Costs for TGL Generators

ITEM	COST FACTOR	UNIT COST	COST, $
DIRECT ANNUAL COSTS (DC)			
Operating Labor			
Operator	0.5 hr/shift	$50/hr	2,250
Supervisor	15% Operating Labor	NA	338
Maintenance			
Annual Maintenance		1.5% of TCI	6,787
Catalyst Replacement Labor	8 workers - 80 hrs every 3 yrs	$60/hr	22,800
Ammonia Sys. Maint. Labor	20 hr/yr	$60/hr	3,200
Ammonia	19% Aqueous Ammonia	$360/ton	24,037
Catalyst	100% replaced / 3 years	Catalyst Replacement	20,039
INDIRECT ANNUAL COSTS (IC)			
Administrative Charges	2% TCI		9,050
Property Taxes	1% TCI		4,525
Insurance	1% TCI		4,525
Capital Recovery	CRF * TCI		42,716
Total Annual Cost (TAC) ($)	Sum of Annual Costs		**140,266**
Total Pollutants (NOx) Controlled (ton/yr)	As Calculated		13
COST EFFECTIVENESS ($/TON)	TAC/tpy controlled		**11,038**

*** CRF = 0.0944 assuming 7% interest over 20 years**

*** Vendor projected removal efficiencies: 90% N0x**

Appendix E
40 CFR 63 Subpart Y Applicability Evaluation

NESHAP

Clean Air Act ("CAA") section 112 authorizes the EPA to regulate the emission of hazardous air pollutants ("HAPs"). CAA section 112(d) requires EPA to promulgate regulations establishing emission standards for each category or subcategory of major sources listed by the EPA under Section 112(c) of the CAA ("Listed Sources"). The emission standards for Listed Sources are referred to as National Emission Standards for Hazardous Air Pollutants ("NESHAP").

The NESHAP establish Maximum Achievable Control Technology ("MACT") standards for setting emissions limits for new and existing Listed Sources. In those instances where EPA has not established a MACT standard applicable to a major source of HAPs (i.e. for sources that are not a Listed Source), CAA section 112(g) applies. Under section 112(g), the MACT emission limitation is developed on a "case-by-case" basis.

MACT for new sources (whether listed under 112(c) or not) is defined in 40 CFR § 63.41 as follows:

> Maximum achievable control technology (MACT) emission limitation for new sources means the emission limitation which is not less stringent than the emission limitation ***achieved in practice by the best controlled similar source***, and which reflects the maximum degree of reduction in emissions that the permitting authority, ***taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts*** and energy requirements, determines is achievable by the constructed or reconstructed major source. (emphasis added)

In 1995, EPA promulgated a specific MACT standard for HAP emissions from marine tank vessel loading operations—a listed source—under 40 CFR Part 63, Subpart Y ("Subpart Y"). Under Subpart Y, new, major offshore sources are required reduce HAP emissions from marine tank vessel loading operations by 95 weight-percent. HAP emissions can be controlled using one of two primary methods: a vapor combustion unit ("VCU") or a vapor recovery unit ("VRU"). 59 FR 25004, 25007 (May 13, 1994).

While the proposed DWP facility does involve loading of large marine tankers, Texas GulfLink asserts that the anticipated emissions are more appropriately considered through a case-by-case MACT analysis because: (1) the DWP proposed source does not fall within the types of sources or subcategories of sources covered by Subpart Y; (2) VCUs and VRUs are not "achieved in practice" for a DWP such as Texas GulfLink; and, most importantly, (3) the use of VRUs/VCUs on offshore platforms as would be required under Subpart Y raises serious safety concerns (i.e. safety being among the "non-air quality health impacts" that must be considered under any MACT analysis). Under a case-by-case MACT analysis, the only level of emissions control for similar sources "achieved in practice" is that achieved using submerged fill loading under a VOC Management Plans per MEPC.185(59) and MEPC.1/Circ. 680.

SUBPART Y MACT v CASE-BY-CASE MACT

Subpart Y was adopted in 1995 and subsequently amended in 2011. At the time of its original adoption and subsequent amendment, there were no offshore DWPs receiving product via subsea lines from onshore facilities. Likewise, there were no offshore DWPs loading the volumes of crude oil, or located as far from shore, as the proposed DWP facility contemplated by Texas GulfLink. In part, this was because crude oil exports from the United States were banned from 1975 to 2015 under the 1975 Energy Policy & Conservation Act. As a result, the then-existing marine tank vessel loading sources and subcategories of sources considered by EPA in developing the emissions standards contained in Subpart Y were not operationally representative of the type of DWP project proposed by Texas GulfLink. Rather, emissions from the proposed DWP are more properly analyzed under a case-by-case MACT analysis.

A. Subpart Y

On its face, it might appear that the proposed DWP source is subject to Subpart Y since that subpart deals with emissions from marine vessel loading operations. In fact, a close analysis of the rulemaking history reveals that the regulations developed and standards adopted under Subpart Y did not consider sources that are representative of the proposed DWP. That is, the proposed DWP is simply not among the categories and subcategories of sources subject to the MACT standard under Subpart Y. EPA would need to undertake a rulemaking to expand the number of source subcategories covered under Subpart Y for it to apply to sources like Texas GulfLink's proposed facility.

1. <u>Subpart Y Rulemaking History</u>.

Subpart Y was first promulgated in 1995 and amended in 2011. Beginning in 1992, EPA began developing the various categories of Listed Sources. Initially, EPA did not include marine tank loading operations among the 1992 Listed Sources stating:

> "Marine vessel loading and unloading facilities are not listed on today's list because the Agency intends to regulate HAP's as well as emissions of VOCs and other pollutants under authority of section 183(f) of the CAA. Section 183(f) requires that the Agency, in conjunction with the Coast Guard, establish emissions standards for emissions of VOC's and any other air pollutant from loading and unloading tank vessels. Given the Congressional mandate to consult with the Coast Guard and consider safety impacts in developing tank vessel standards, the Agency believes it advisable to address all tank vessel emissions in a comprehensive, multi-faceted manner under section 183(f)" (57 FR 31576, 31586 (July 16, 1992)).

In 1993, EPA decided to regulate HAP emissions from these types of sources under the authority of CAA section 112 and added marine tank loading operations to the Listed Sources. Although section 112 of the CAA does not specifically address Coast Guard regulations on safety, EPA considered safety issues in developing regulations proposed under section 112 for marine tank loading operations stating in the preamble to the proposed regulation that "a primary concern in the implementation of these proposed regulations is safety." 59 FR 25004, 25017 (May 13, 1994).

In 1994, EPA proposed NESHAP for marine tank loading operations. 59 FR 25004 (May 13, 1994). EPA sought comments on whether "offshore terminals" should be placed in a separate subcategory. Offshore terminals are terminals that are at least one-half mile from shore. Ultimately, EPA adopted a subcategory for offshore terminals, and recognized that offshore terminals present unique regulatory challenges such as increased cost, unique environmental impacts, and size constraints. 60 FR 48388, 48393 (September 19, 1995).

The 1995-adopted NESHAP set MACT standards for several subcategories of the marine tank loading operations category, including new major source offshore terminals. Based on comments received during the rule-making, EPA determined there were no more than 20 offshore terminals with subsea lines (i.e. lines that run along the sea floor rather than on piers or docks) in existence. 60 FR 48388, 48393 (September 19, 1995). None of those terminals controlled emissions from marine tank vessel loading. 60 FR 48388, 48393 (September 19, 1995). EPA was made aware of only two offshore terminals (both lacking subsea lines) that were presently controlling emissions. 60 FR 48388, 48393 (September 19, 1995). However, EPA did not have any information regarding the specific control techniques used at these 2 terminals. 60 FR 48388, 48393 (September 19, 1995). While EPA stated it was aware there were additional offshore terminals without subsea lines, it was unable to quantify the total number in existence.[1] As a result, EPA assumed there were fewer than 30 offshore terminals in determining the "MACT floor" (i.e. the process by which the MACT limit is analyzed and set).

CAA section 112(d)(3) provides that the MACT floor for an existing source is:

- the average emission limitation achieved by the best performing 12 percent of the existing sources (for which the Administrator has emissions information)… for categories and subcategories with 30 or more sources, or
- the average emission limitation achieved by the best performing 5 sources (for which the Administrator has or could reasonably obtain emissions information)… for categories or subcategories with fewer than 30 sources.

Because EPA assumed there were fewer than 30 offshore terminals, it tried to identify the emission limitation achieved by the best performing 5 sources. There were only 2 offshore terminals controlling emissions (again, both lacking subsea lines) and those terminals were controlled to a level of 95 percent. Taking the average (or mean) of 3 offshore terminals with 0 control and 2 offshore terminals with 95 percent control resulted in an emission limitation of 38 percent.[2] This percentage did not match a known control technology, so EPA used the median

[1] Docket A-90-44, Item Number IV-B-2.
[2] Docket A-90-44, Item Number IV-B-2.

(rather than mean) of the 5 sources to determine that no control was the MACT floor for existing offshore terminals.[3]

For new sources (as opposed to existing ones), CAA section 112(d)(3) provides that the MACT floor "shall not be less stringent than the emission control that is achieved in practice by the best controlled similar source." Although EPA had little to no information at its disposal regarding the control techniques at the 2 controlled offshore terminals without subsea lines and had not identified any controlled offshore terminals with subsea lines, EPA determined that the MACT floor for all new offshore terminals (with or without subsea lines) should be a 95 percent reduction in HAP emissions. 60 FR 48388, 48395 (September 19, 1995).

In a 2008 proposal, EPA stated that it had not identified any advancements in practices, processes, and control technologies for marine tank loading operations. 73 FR 60432, 60457 (October 10, 2008). In a 2010 supplemental proposal, EPA stated that vapor collection and processors (recovery) was a possible control for certain marine tank loading operations involving gasoline loading. 75 FR 65068, 65115 (October 21, 2010). Ultimately in the rule amendment adopted in 2011, EPA determined that vapor recovery was not cost-effective and only required *existing* offshore terminals to use submerged fill, which EPA identified as the MACT floor level of control. 76 FR 22566, 22571 (April 21, 2011). By authorizing submerged loading for existing offshore sources, EPA recognized it as a viable option for controlling emissions. Again however EPA did not consider sources like the proposed DWP facility because none were in existence at the time and did not consider how the presence or lack of subsea lines might impact the ability to deploy vapor recovery and the associated safety issues when vapors are transported in rigid pipelines or flexible lines for long distances in deep water.

2. The Sources Considered by EPA in Adopting Standards Under Subpart Y Are Not Representative of the Proposed Source.

Texas GulfLink's proposed loading of VLCCs by transporting crude oil via subsea lines to a manned platform, and then from the platform to two pipeline end manifolds ("PLEMs") located on the sea floor, and from the PLEMs via flexible pipe or hose to two SPM buoy systems at the surface, does not fit within any of the source categories or subcategories evaluated during the Subpart Y rulemaking process. It is not surprising that there were no representative sources similar to Texas GulfLink's proposed crude oil exporting facility in existence at the time EPA adopted Subpart Y in 1995 or when it amended Subpart Y in 2011. Crude oil exports from the United States were banned from 1975 to 2015 under the 1975 Energy Policy & Conservation Act.

Evaluation and promulgation of an additional subcategory under Subpart Y may ultimately be required. Adoption of a new subcategory should take into account the distance of the DWP from shore, whether subsea lines are being used, characteristics of the commodity being loaded, loading rates, the size of ship being loaded, and the unique operational and safety concerns

[3] Docket A-90-44, Item Number IV-B-2.

associated with DWPs. Until that occurs, emissions from DWP facilities such as the one proposed by Texas GulfLink are more properly analyzed under section 112(g) of the CAA using a case-by-case MACT analysis. Furthermore, as discussed below, employing vapor recovery and combustion (as would be required under Subpart Y) on a manned platform located more than 28 miles from shore is not a viable option for numerous obvious safety and operational reasons.

B. Case-by-Case MACT

Because Subpart Y does not apply to Texas GulfLink's proposed platform and SPM system, the emissions limit is set by performing a case-by-case MACT analysis. 40 CFR §63.43(d)(1)-(4) sets out the requirements for preparing a case-by-case MACT assessment.

> (d) Principles of MACT determinations. The following general principles shall govern preparation by the owner or operator of each permit application or other application requiring a case-by-case MACT determination concerning construction or reconstruction of a major source, and all subsequent review of and actions taken concerning such an application by the permitting authority:
>
> > (1) The MACT emission limitation or MACT requirements recommended by the applicant and approved by the permitting authority shall not be less stringent than the emission control which is ***achieved in practice by the best controlled similar source***, as determined by the permitting authority.
> >
> > (2) Based upon available information, as defined in this subpart, the MACT emission limitation and control technology (including any requirements under paragraph (d)(3) of this section) recommended by the applicant and approved by the permitting authority shall achieve the maximum degree of reduction in emissions of HAP which can be achieved by utilizing those control technologies that can be identified from the available information, ***taking into consideration the costs of achieving such emission reduction and any non-air quality health and environmental impacts*** and energy requirements associated with the emission reduction.
> >
> > (3) ***The applicant may recommend a specific design, equipment, work practice, or operational standard***, or a combination thereof, and the permitting authority may approve such a standard ***if the permitting authority specifically determines that it is not feasible to prescribe or enforce an emission limitation*** under the criterial set forth in section 112(h)(2) of the Act.
> >
> > (4) If the Administrator has either proposed a relevant emission standard pursuant to section 112(d) or section 112(h) of the Act or adopted a

> presumptive MACT determination for the source category which includes the constructed or reconstructed major source, then the MACT requirements applied to the constructed or reconstructed major source shall have considered those MACT emission limitations and requirements of the proposed standard or presumptive MACT determination. (emphasis added).

Setting the MACT limit for the proposed source is a two-step exercise. First, the applicant must set the "MACT floor" by identifying "the emission control achieved in practice by the best controlled similar source" (if one exists) taking into consideration "the costs of achieving such emission reduction and any non-air quality health and environmental impacts." 40 CFR § 63.43(d)(1)-(2). If the permitting authority (in this case, the EPA) determines it is not feasible to enforce a specific emissions limit, then it can approve a "specific design, equipment, work practice, or operational standard, or a combination thereof." 40 CFR § 63.43(d)(3). The second step, referred to as "beyond-the-floor" analysis, involves analyzing whether further emissions limitations are appropriate under other available control technologies or methods.

1. Setting the MACT Floor.

The applicable MACT floor is achieved through submerged fill employing a VOC Management Plan (a "work practice") under MEPC.185(59) and MEPC.1/Circ. 680.

a. Best-Controlled Similar Sources Achieved In Practice.

Under a VOC Management Plan employing submerged fill, crude oil is loaded into the holds of VLCCs at a point below the surface of the oil in the hold. This limits the turbulence and disturbance of the surface of the liquid cargo thereby minimizing hydrocarbon volatilization and resulting VOC and HAP emissions.

b. Non-Air Quality, Health and Safety-Related Impacts.

Before setting a permit MACT limit, EPA must first take into consideration "the costs of achieving such emission reduction and **any non-air quality health** and environmental **impacts** and energy requirements associated with the emission reduction." 40 CFR §63.43(d)(2)(emphasis added). One significant potential non-air quality impact is the safety of the workers on Texas GulfLink's proposed manned platform and the safety of the ships during loading operations. Controlling emissions through submerged fill does not create the same extent of safety concerns and those created if vapor recovery and combustion were deployed.

Capturing hydrocarbon vapors would require additional lines between the ship and the SPMs, between the SPMs and the PLEMs, and between the PLEMs and the platform where the VCU would necessarily be located. That is, in addition to the subsea lines carrying crude oil from the platform to the PLEMs, and the flexible lines carrying crude oil from the PLEMs to the SPMs and from the SPMs to the ships being loaded, another set of lines would be required to transport the vapors away from the ship to the SPM, from the SPMs to the PLEMs, and then from the PLEMs to the platform. These extra lines complicate navigational issues especially during rough seas because the lines can become twisted and kinked which can create back pressure which is a danger to the ship and its crew.[4]

Furthermore, because these additional vapor lines are necessarily on or below the surface of the cooler seawater, it is inevitable that some of the vapors will condense and accumulate thus creating back pressure leading to an unsafe condition for the ship and its crew. VLCCs can generate a maximum of two (2) psi to push vapors back to the platform—in this case, a platform located more than 1.4 miles away from the VLCC being loaded.[5] Further, under Oil Companies International Marine Forum ("OCIMF") guidelines, VLCC's should follow applicable Classification recommendations stipulating that the Tanker should operate at 70% of that pressure (or 1.4 psi).[6]

In addition to liquid hydrocarbons, water can also build up in the vapor hoses between the VLCCs and the SPM endangering ship and crew. The hose string from the VLCC manifold drops about 30 feet from the ship to sea level, travels approximately 1100 to 1200 feet on the surface with the hoses in motion from the rolling seas, then rises about 8 to 10 feet to the top of the SPM buoy. This effectively creates a large "p-trap." Water will drop out and buildup along the hose length, especially from the warmer gas coming off the VLCC and then contacting cooler seawater surrounding the hoses. The water will slowly build up in the hose thus reducing the flow rate of vapor through the hose. Eventually, water lying in the bottom of the vapor hose will accumulate to a point of forming a water slug, blocking off the flow of vapors in the hose entirely. To lift (push) the water plug up 10 feet to the top of the buoy requires at least 3 to 4 psi to clear the hose. Again, the VLCC should operate its system at no more than 1.4 psi per Classification recommendations.

Importantly, Texas GulfLink's SPM vendor, the largest supplier of SPMs and SPM technology in the world, did not have a product capable of vapor recovery and has indicated that it will not commit to perform the R&D necessary to redesign its SPMs in order to accommodate vapor recovery.

Finally, VCUs installed on manned platforms, with limited available space, and located far from shore create additional worker safety issues and complicate the ability to quickly and safely

[4] Also, VLCC's moored at Texas GulfLink will be 1.25 nautical miles (nm) or about 7600 ft from the platform. Other DWP applicants have proposed that VLCCs be moored at about one-half the distance or 0.66 nm (about 4000 ft) from the manned platforms. Based on the opinions of Texas GulfLink's staff and consultants with significant navigational and safety experience, VLCCs should be moored no closer than 1.0 nm from manned platforms. If a ship comes within 0.2 nm (or about 1200 feet) of a manned platform, the platform should be evacuated. VLCC are approximately 1100 feet in length. The mooring hawser is about 200 feet in length. The tug tether adds about 400 feet for a total of about 1700 feet. A platform situated 4000 feet from an SPM leaves only about 2300 feet between the manned platform and the VLCC departing the SPM. Texas GulfLink's design means that any vapor recovery lines would be approximately twice as long as other DWP applicants.

[5] VLCC individual tank mechanical p/v values (bullets) are set to open at 1440ml of water, which equals 2 psi.

[6] The American Bureau of Shipping VOC Management Plan best practices include a target operating pressure of about 70% of P/V valve setting pressure: 1400 mmWG.

respond in the event of an explosion, fire, or other malfunction related to VCU operations. The VCUs would require fuel (propane) to operate efficiently and that propane must be stored in tanks on the manned platform creating additional safety concerns due to the volatile nature of propane verses diesel fuel that is stored on the platform. These safety concerns further negate the viability of setting a MACT limit under Subpart Y.

i. Analogy: Exemptions Under OCS Regulations.

It should be noted that EPA, in other contexts, has rules exempting sources from air quality compliance when the agency determines that a particular control technology creates or contributes to unsafe conditions. The EPA's Outer Continental Shelf Air Regulations under 40 CFR Part 55 (which applies to offshore drilling and production platforms and vessels) expressly provide for an exemption when the agency "finds that compliance with the control technology requirement is technically infeasible or will cause an unreasonable threat to health and safety." 40 CFR §55.7(a). These same regulations distinguish between sources located closer to shore and those located more than 25 miles from a state's seaward boundary. OCS standards creating this exemption from strict compliance with air quality regulations are instructive—especially in the context of the unique safety issues that arise when control technologies dictated by Subpart Y are applied in an offshore, deep water environment.

c. Work Practices or Operational Standards as an Acceptable Substitute for An Emissions Limit.

40 CFR §63.43(d)(3) provides that an applicant can propose a "work practice, or operational standard, or a combination thereof, and the permitting authority may approve such a standard if the permitting authority specifically determines that it is not feasible to prescribe or enforce an emission limitation." (emphasis added). The VOC Management Plan (implementing a "work practice") is a ship-specific management plan designed to minimize VOC emissions during loading operations through best management practices and is an acceptable substitute for a specific emissions limit—especially after considering the safety issues discussed above.

With respect to the loading operations at the proposed SPM buoy system, Rule 1.4. of the VOC Management Plan Guideline MEPC.185(59) states that while maintaining the safety of the ship, the VOC Management Plan should encourage and set forth the following best management practices as appropriate:

(1) The loading procedures should take into account potential gas releases due to low pressure and, where possible, the routing of oil from crude oil manifolds into the tanks should be done so as to avoid or minimize excessive throttling and high flow velocity in pipes;
(2) The ship should define a target operating pressure for the cargo tanks. This pressure should be as high as safely possible and the ship should aim to maintain tanks at this level during the loading and carriage of relevant cargo;

(3) When venting to reduce tank pressure is required, the decrease in the pressure of the tanks should be as small as possible to maintain the tank pressure as high as possible.

(4) The amount of inert gas added should be minimized. Increasing tank pressure by adding inert gas does not prevent VOC release but it may increase venting and therefore increase VOC emissions.

Technical support developing VOC Management Plans for crude oil loading of VLCCs is provided in MEPC.1/Circ.680.

Because VOC Management Plans are developed on a ship-specific basis, there is no specific emissions limit that can be prescribed under submerged loading. Rather, the emissions limit will vary depending on the specific size and design of the ship being loaded. Therefore, it is appropriate to adopt plans that comply with MEPC.185(59) and the guidance developed to implement the appropriate methods, procedures, and systems to control VOC emissions.

2. Beyond the MACT Floor

The second step in analyzing the MACT limit involves analyzing whether further emissions limitations beyond the MACT floor can be achieved under other available control technologies or methods. Though there is no DWP source similar to the proposed source that has achieved reductions in HAP emissions beyond that achieved through submerged fill in conjunction with a VOC Management Plan, Texas GulfLink nevertheless considered controlling HAP missions through vapor recovery and combustion which is an established control technology used at *onshore* facilities to control VOC emissions. However, the technical difficulties and safety concerns associated with transporting the VOCs from the ship to the platform, and the space limitations and additional safety concerns associated with placing a VCU system on a small platform located more than 28 miles from shore, render vapor recovery and combustion unworkable and unreasonably dangerous.

Appendix F
Air Quality Analysis in Support of Major New Source